The
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Ship Propulsion

IT is a far cry from the electrically propelled *Tynemount* with its couple of 300-h.p. Diesel-driven generators to the *Normandie*, which has on board nearly 150,000 kW of generating plant, a capacity exceeded by only three of our selected stations (Barking and the two Deptfords) and more than enough to work the whole of the London Underground Railways.

We need not, however, go back twenty-three years to illustrate the advance in magnitude of marine electrical work represented by the French liner that is due to make its maiden voyage to the United States on May 29th. Such vessels as the *Strathaird*, the *Strathnaver*, the *Monarch of Bermuda* and the *Queen of Bermuda*—all over 22,000 tons—which have been built during the past few years in British shipyards (the last-named being the largest turned out in 1933) require up to 28,000 shaft h.p. each, but even these notable examples are overshadowed by the 160,000 h.p. that is needed to send the new liner through the water at the 33 knots reported to have made during her trials.

The point that stands out in all these instances is that the generating plant for propulsion is many times that installed for general purposes; in the *Normandie* the ratio is about ten to one. The function of electricity here is essentially that of providing flexible gearing to enable a high-speed prime mover to rotate a low-speed propeller. The considerations that influenced the decision to adopt electrical rather than mechanical gearing on the French boat were its relative freedom from noise and vibration, economy in fuel at lower speeds when two propellers can be driven from one alternator and ease of manœuvring, for which the main turbines can be used up to full-speed astern merely by changing the phase rotation of the motors.

These advantages were regarded as more than enough to counterbalance those possessed by geared turbines in weight and space occupied and in superior economy at full load. Presumably, geared turbines would also have cost less, but with steam at 400 lb. per sq. in., and the ability with the electrical method to use turbines of higher speed and more suitably placed condensers, would affect this saving to an appreciable extent.

The *Normandie* can be claimed to provide an *a fortiori* case for electrical propulsion in that the two important factors of economy at reduced speed and of ease of manœuvring are not of the same importance to a vessel with long runs at full power as to many others, *e.g.*, the *Viceroy of India*.

The performance of the new liner will be keenly observed in Great Britain. We have in mind not only the projected sister ship to the *Queen Mary*, but also the modern vessels of similar tonnage that will be required for our mercantile marine in the future. The proportion of British-owned electrically-propelled vessels is now very far from being commensurate with the predominance of our mercantile marine. In making up leeway the successful working of the vessels mentioned should be enough to justify every confidence being placed in our electrical manufacturers, several of whom provided equipment for the new liner.

Assisted Wiring Schemes

IT is easy to institute an assisted wiring scheme, but not so easy to make it "go" if the conditions are not such as to attract a large number of consumers. There are schemes which can appeal only to the comparatively well-to-do, who probably prefer to pay for their installation at once. These are of the type involving a quarterly payment, which puts them out of court for people who are compelled to spend their little income week by week. For these people an addition to the flat-rate "unit" charge is suitable, but restrictive in its effects. At say, 7d. a kWh, the use of electricity for anything but lighting and radio, and perhaps an iron, is impossible.

There remains the method suggested by Mr. W. Phœnix in this issue—the division of the wiring charge into weekly portions collected by fixed-charge mechanism in conjunction with a prepayment meter. At Newton-in-Makerfield—a small depressed industrial district—the scheme has proved highly successful in enabling the undertaking to meet what Mr. Phœnix describes as "its moral obligation to supply the poorer classes in their own peculiar way and at the same time make such business economically sound."

An Improved Fair

ONE of the principal reasons for changing the period of the Birmingham part of the British Industries Fair from February to May was the weather. As we write the conditions are hardly distinguishable from winter, but there is still over a week for the weather to justify the alteration. The electrical stands at Castle Bromwich this year are really excellent—perhaps almost too good for an exhibition which lasts for less than a fortnight. The industry is certainly to be praised for a magnificent effort. A great feature of this year's Fair is the enormously increased elbow room. The usual gas industry exhibit has disappeared (probably only temporarily), leaving much more space for the electrical section. As a consequence the stands can be inspected in comfort, which was certainly not the case in previous years. The matter as well as the manner of the display is also worthy of a great industry. Both on the industrial and domestic sides visitors are impressed with the capabilities of British electrical manufacturers and the results should fully reward the enterprise and attention which the exhibitors have shown.

Floodlighting

THANKS are due to a number of our readers in various parts of the country for their thoughtfulness in sending us photographs of electric floodlighting. The co-operation of concerns which have carried out such installation work has enabled us so to supplement the efforts of our own photographers as to represent in our pages practically every kind of building, great and small, in a new light. We publish this week a further and final selection from the collection of examples thus placed at our disposal. A new floodlighting habit has been formed amongst us as the result of the Jubilee, and it is encouraging to know that some of the chief installations in London are to remain permanently available for use whenever the powers in authority decide to use them. There will be many occasions during the next month or two for excellent displays both in big centres and at coastal resorts.

Mr. Frank Parkinson's Lead

WE are very pleased indeed to learn that Mr. Frank Parkinson, of Messrs. Crompton Parkinson, Limited, sent a cheque for £500 to the Electrical Industries' Benevolent Association toward the end of last week. In a leading article on "The Man Without a Job" (ELECTRICAL REVIEW, March 1st, p.297), we made a strong appeal on behalf of the organisation and asked: "Who will lead the way with a substantial donation such as one hears of in other industries?" and added: "Who, too, will follow the lead so that the Association may be made strong and wealthy, firmly established as a refuge for those who are finding it hard to battle with the storms of life?" Mr. Parkinson has given a generous lead, and in doing so has qualified as a vice-president of the Association. How excellent it will be if others at once follow this magnificent lead! While the Jubilee spirit is abroad amongst us, and the electrical industry gives so many signs of increasing prosperity, we feel with Captain J. T. Keeping that there must be many others who will be willing to follow his example. We hope that we shall receive more good news from the General Secretary during the next week or two.

Other Benevolent Funds

AN example of another kind of benevolence, very desirable indeed but giving less immediate aid than lifetime donations to those in need, was mentioned under "Wills" in our last issue. The late Mr. J. A. Edmondson, M.I.E.E., who left an estate of over £80,000, had willed that after a life interest, seven-hundredths of the residue should pass to the Benevolent Fund of the Institution of Electrical Engineers and a similar sum to that of the Institution of Civil Engineers. In each case these Funds will probably benefit by a substantial amount. Both the profession and the industry have need of large resources set apart for the assistance of those who have fallen on bad times. However great the prosperity it must always be so. While there is great satisfaction derived from the building up of funds from deceased estates present needs remind us that: "He gives twice who gives quickly!"

Without Petrol

A CORRESPONDENT in a Sunday newspaper assumes that if the supply of petrol gave out (which is considered to be a possibility) we should become dependent upon the horse and that only the rich would be able to ride or drive, others being compelled to walk. Actually what would happen is that the railway companies would regain tourist and long distance transport from private motor cars and petrol buses, and might be induced to use some of their increased earnings for main-line electrification. Certainly, they would have to do so in urban areas to cope with the extended services that would be necessary as well as construct underground tubes in the more congested districts. The development of the trolley bus would be greatly helped and tramway systems would take on a new lease of life with modernised stock. For town traffic battery-propelled vehicles would at last have a real opportunity and would even continue to supersede horses for certain duties. No doubt, also, battery-charging or exchange stations would spring up like petrol pumps all the way round our large towns, thus increasing the operating mileage.

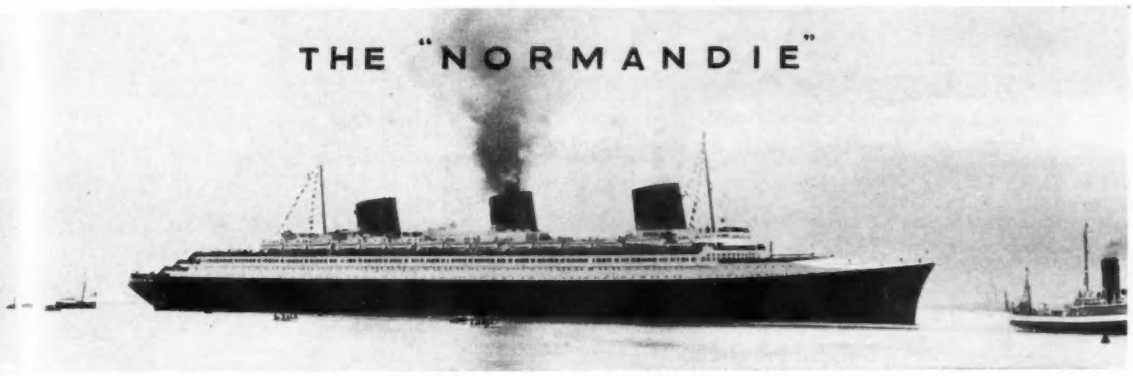
Progress in Cornwall

THE steady progress in the tin-mining industry naturally continues to have a good effect upon the revenue of the Cornwall Electric Power Co. As Sir Holberry Mensforth mentioned at last week's meeting of the Urban Electric Supply Co., a scheme of development is in hand costing about £271,000, which, when completed will provide a network of overhead mains linking up with the existing lines, thus giving a supply to many small villages and local industries. The Hayle generating station of the Cornwall Co. has been operating as a selected station since January this year. Other work upon which the Urban Company is concentrating is the development of its newly-acquired subsidiary the East Anglian Electric Supply Co. Many miles of high and low-voltage lines have been and are being erected in the area, but the reduction of tariffs a year ago has so far prevented the advance in profits from keeping pace with new consumption.

Enlivening the Proceedings

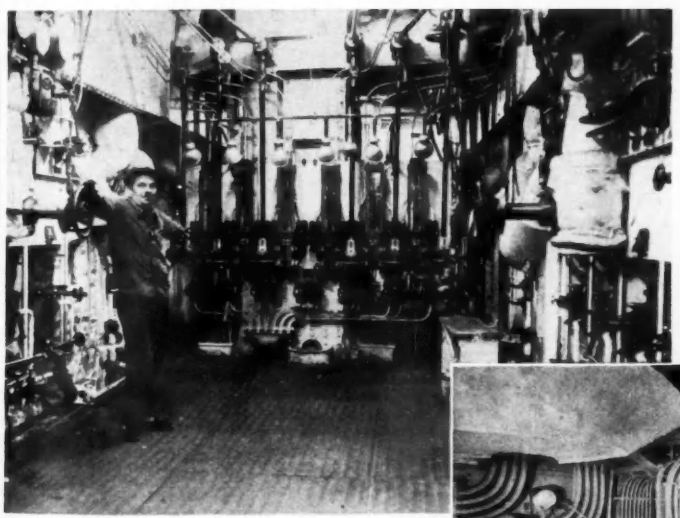
SUGGESTIONS for bringing the Institution of Electrical Engineers more into line with modern life were made at last week's annual meeting. There is no doubt that the purely technical side of electricity is the Institution's main care, but that should not preclude it from giving greater attention to the more material or (to use an overworked adjective) economic aspects of electrical engineering. One member suggested the formation of yet another section for the purpose, but would it not be better if a general "awareness" of that important side permeated the whole of the Institution's proceedings, especially at the informal meetings, which another member would prefer to be less formal?

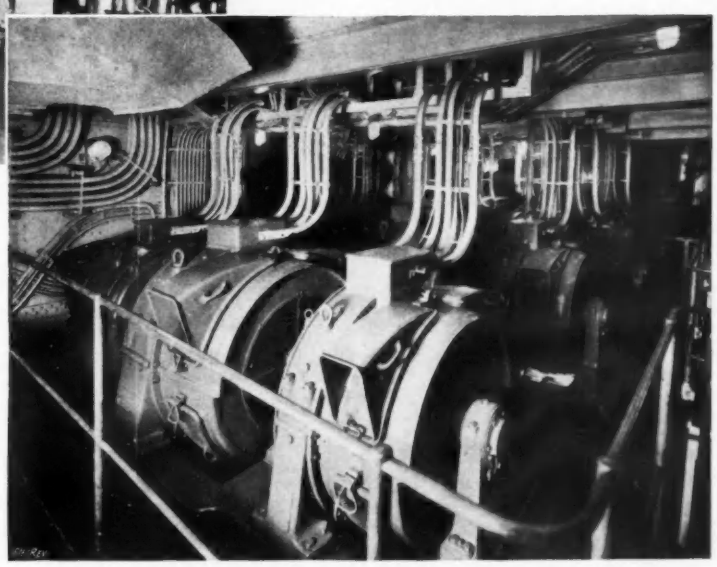
THE "NORMANDIE"



THE longest vessel in the world, the liner *Normandie*, built by the Compagnie Générale Transatlantique, recently completed her trials. Her main dimensions are 1,029 ft. 5 in. long by 119 ft. 5 in. beam and the tonnage is 79,000. She is destined for the Atlantic run and is scheduled to depart for her maiden voyage on May 29th. Although the chief interest to us lies in the adoption of electric propulsion for achieving a speed of twenty-eight knots, the use of electricity for other and widely diverse purposes is on a scale comparable with the size of the vessel.

The propulsion system, contained in six water-tight sections, is entirely distinct from that employed for general electrical service about the vessel, only the boilers being in common. The twenty-nine main boilers are of the Penhoet tri-drum type and are oil-fired, each boiler having four 1,100-lb. burners with double air regulation. Steam conditions are 400 lb. per sq. in. and 680 deg. F. Tubular air heaters recover most of the heat in the flue gases, the air for combustion being then led through the space surrounding the boilers to make use of the radiated heat. Superheated steam is used for cleaning the tubes by means of Paradox soot blowers.





The left-hand picture shows the stokehold, in which the remote water-level indicators are seen. On the right is the excitation group

The external surfaces of the boilers are heat-insulated by glass-silk mattresses. Each boiler is fitted with two Cocard-Lombard safety valves, one on the saturated steam chest with a pilot valve and the other after the superheater. Non-return Cockburn valves with remote control isolate the superheaters from the boilers and from the main steam receivers. Another piece of apparatus of British manufacture is the Kelvin remote-controlled water-level indicators. Air for combustion is supplied to the boilers by twenty-one Howden blowers, which also assist in the ventilation of the boiler room.

Each of the four groups of boilers is equipped with its own oil-fuel pumps, strainers and heaters, with four complete units as a common stand-by. Variation of output from the electrically driven fuel pumps is obtainable by change in speed or by automatic by-pass.

Independence of the four propulsion groups is obtained by the installation of five main steam receivers, the fifth of which supplies the d.c. turbo-generators, but the receivers can be cross-connected in emergency. All flanges of the high-pressure piping are screwed and welded, the joints being of striated iron rings. There are also four cylindrical boilers, fitted with Wallsend oil burners, which supply steam at 140 lb. per sq. in. for general service and also for the condenser air extractors and feed-water heaters and boiler feed make-up. The twelve S.C.A.M. feed-water heaters are of the free expansion type and work in conjunction with six Weir pumps with an output of 440,000 lb. at 510 lb. per sq. in. The feed-water heaters for the auxiliary boilers are also of the same make.

The normal output of each of the four main turbo-alternators is 33,400 kW at 6,000 V; these sets do not run in parallel. The turbines are of the impulse type having thirteen nickel-chrome steel discs (the first in two stages) in the h.p. cylinder and three discs in each section of the double-flow l.p. cylinder.

Close speed regulation is obtained between 500 and 2,430 r.p.m. by servo-motor controlled throttle valves operated from the main control deck. The h.p. cylinder is bled at two points for feed-water heating. The underslung condensers have an effective surface of 23,600 sq. ft. each, and their tubes are of chromium bronze. Crockett salinometers are installed to detect any leakage of sea water into the feed-water system.

The stator of the four-pole alternator is constructed of electrically welded parts, and the rotor is a solid one piece wrought shaft. Excitation current is obtained from one of five exciters (one spare) composed of a d.c. motor and two generators, the second of which is used for exciting the propulsion motor.

Each of the five propeller shafts is driven by a 40-pole, 240-r.p.m. 40,000-h.p. synchronous motor normally supplied from one alternator, but two motors on the same side of the vessel can be connected to either of the two alternators on that side. A Michell thrust block is interposed between the motor and the shaft. The stator is in two fabricated pieces. The rotor is made up of four cast-steel drums, kept in place by steel bands carrying the forty poles and a large amortising cage.

Between the motor and the alternator is the remote operated high-voltage cellular switchgear for controlling the machines and for altering the direction of rotation of the motor; the latter operation is performed by five quick-break contactors

with magnetic blow-outs which change over two of the phase connections of the stator. The Société Alsthom built the four turbo-alternators, propeller motors, exciters and the entire control and manœuvring gear.

Six 2,200-kW 220-V shunt-wound d.c. generators supply energy for the auxiliaries and for power and lighting throughout the ship. These are driven through single-reduction gearing at 230 r.p.m. by nine-disc impulse turbines running at 5,130 r.p.m. The fire-fighting installation in the turbine room and boiler house provides for a continuous discharge of liquid carbonic acid when the ambient temperature exceeds a predetermined figure.

The largest distributor cable has a conductor area of 1.55 sq. in. If the out-of-balance current in the neutral exceeds 200 A, or the voltage between either outer and neutral exceeds 130 V, a limiting relay cuts off the supply to the outers. In the first-class cabins—the only ones having concealed wiring—the wires of each polarity are cased in separate metal tubing coated with an insulating enamel.

When the vessel is in port supplies of electricity can be taken from the shore. Two 150-kW Diesel sets on the forward part of the upper promenade deck feed a special circuit for maintaining essential supplies in emergency. A second emergency circuit is fed by a 110-V, 528-Ah cadmium-nickel battery. There are also fifteen 24-V, 20-Ah trickle-charged batteries of the same type which come into use automatically on the failure of supply to certain lamps. The two gyro-compasses can be supplied from two independent 220-V batteries, but normally they are fed by four convertors which transform the general d.c. supply to a.c. with variable frequency. Other batteries are used for clocks, fire extinguishers, and communications.

Left: The main electrically equipped galley showing the 56-ft. long double-fronted cooking range. Right: Part of the Grand Salon

In the centre of the main kitchen of the *Normandie* is a double-fronted electric cooking range 56 ft. in length with fifty-six boiling plates, thirty-two ovens and sixteen steam ovens. A warming table of similar length is fitted with eighteen bains-marie and twenty serving windows for the first-class dining saloon. Backing on to it is a plate-heater, and another warming table 23 ft. long with six bains-marie and ten serving windows for the tourist and third-class saloons. Other electrical equipment in the kitchen includes six electric grills, two electrically heated steam ovens, and two 20-gal. mixers.

The first-class pantry at the forward end includes three 20-litre boilers, coffee percolators, four 2-gal. milk warmers, eight cereal cookers and two egg-boilers. The pantry for the other classes at the back of the kitchen is similarly equipped. On the port side of the vessel are the two ovens for confectionery and pastry making and a 15-gal. mixer, vegetable washer and potato peeler and washing-up sinks. Baking is carried out on the starboard side in one four-compartment two-tier oven, and nearby is the ice-cream room with three machines and eight ice-rooms on the Frigidaire system.

Consideration was given to the use of a.c. for general purposes, but it was held to be safer to use d.c. at 110 V on a three-wire system for the cabins in view of the possible effects of salt laden air. The same risk was not so great in relation to the motors at the bottom of the ship, as the use of enclosed machines with suitable protective gear was regarded as permissible. The chief objection here to the use of a.c. was the size of the transformers required in some cases.

The radio installation (carried out by the Société Radio-électrique) has been divided into two distinct sections—one for commercial telegraphic and telephonic communication, and one, exclusively telegraphic, for navigation. The commercial installation comprises a radio-telegraph transmitter, receivers for short, medium and long waves, an extra-long-wave receiver, a telephonic transmitter, a short-wave telephonic receiver, a device for giving bilateral connection and two frequency meters. By means of the short-wave transmitter passengers on the vessel will be able to communicate with telephone subscribers in France, Great Britain and the United States. The navigation installation comprises a transmitter working on six bands of waves from 600 to 2,400 metres, one short and one long wave receiver, a radiogoniometer and a depth sounding device.

The I.E.E. Annual Meeting

THE sixty-third annual general meeting of the Institution of Electrical Engineers was held in London on May 16th. Dr. W. M. Thornton, president, announced the premiums awarded for papers read during the session and then outlined the Council's report for the year 1934-35, drawing special attention to the Benevolent Fund.

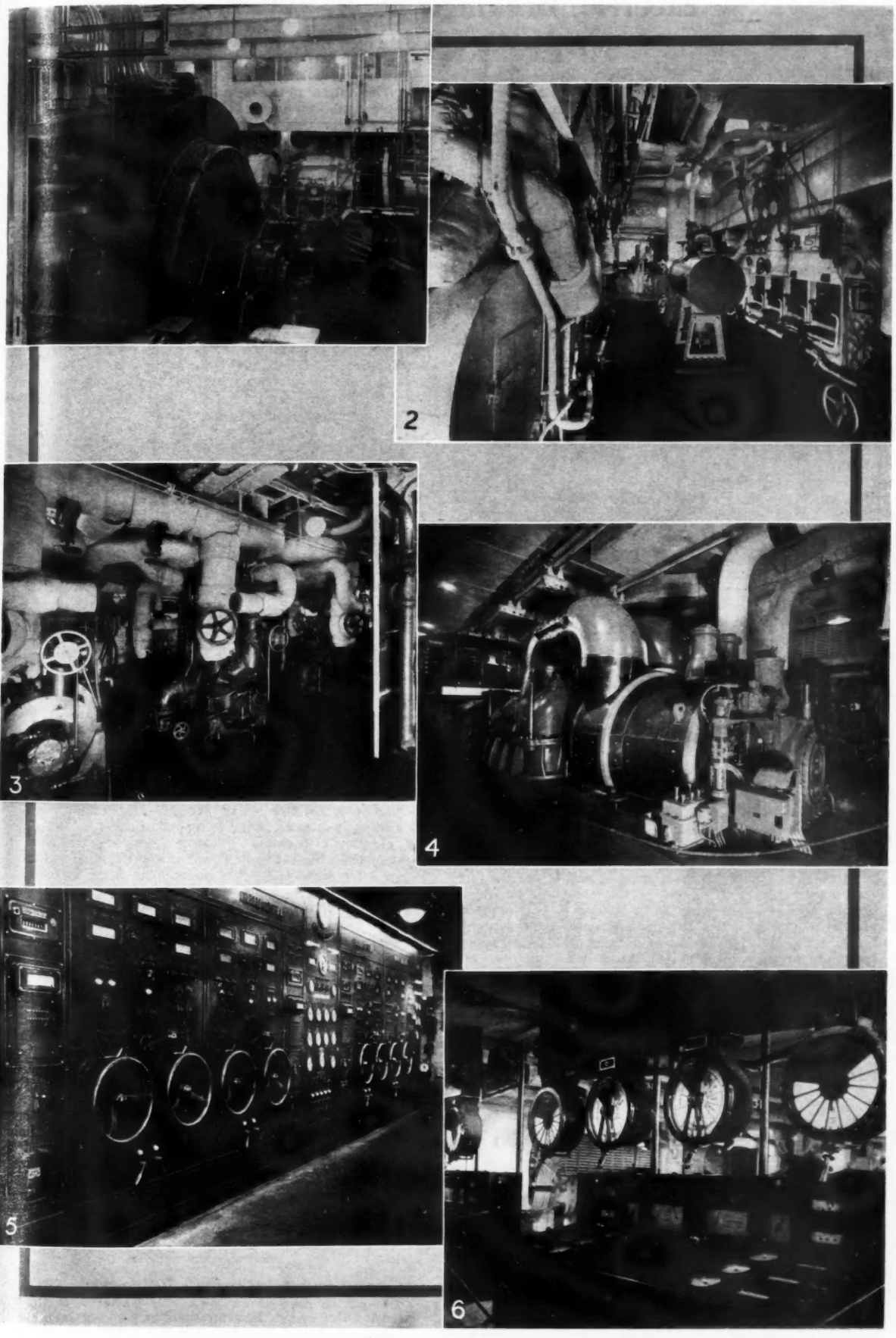
Mr. J. I. Bernard suggested that there was a need for more papers on the utilisation of electricity, remarking that many of the more recent applications of light, heat, and power were quite new, and information about them should have a worthy place in the I.E.E. proceedings.

Mr. D. J. Bolton supported Mr. Bernard's contention and also advocated some form of supervision of papers and prior planning of meetings, so as to afford opportunities for controverting statements likely to be misleading or even harmful.

Mr. L. W. Phillips said he would like the Institution to show signs of vitality rather than of prosperity and bulk. With regard to canvassing for Council membership, did not the Council itself canvass when it announced its own nominations? Outside nominations should be invited and published simultaneously with the Council's nominations. Mr. Phillips also suggested the formation of two new sections, one to deal with economic and industrial (including labour) subjects and the other to discuss educational matters. He wished for closer contact between the electrical and medical professions, and also for less formality at the formal meetings.

Mr. W. F. Crawter submitted a statement of accounts and Mr. W. C. P. Tapper suggested the advisability of realising certain investments to avoid depreciation on approaching maturity. The report and accounts were adopted unanimously.

At the conclusion of the meeting six short "speaking portraits" of eminent electrical engineers, namely, Sir William H. Bragg, Sir Richard T. Glazebrook, Sir Oliver Lodge, Sir J. J. Thomson, Col. R. E. B. Crompton, and Mr. W. M. Mordey, were exhibited. Similar talking films have been made of Sir J. A. Fleming, Prof. A. E. Kennelly, and Dr. Elihu Thomson, and others are to be added to the collection during the coming year. Members will be afforded opportunities of seeing them at meetings from time to time.



Some of the Plant in the French Liner "Normandie"

1. One of the 40,000-h.p. propulsion motors. 2. No. 3 boiler room. 3. No. 4 boiler room showing the turbine feed pumps. 4. No. 3 turbo-alternator. 5. The control platform. 6. The main manœuvre platform

Electric Braking. By D. Sanderson

Its application to induction motors

INDUCTION motors do not lend themselves readily to the various forms of electric braking usually associated with the d.c. type. Nevertheless, it is possible to reproduce similar effects with reasonable results.

Electric braking can be applied to induction motors by the plugging, regenerative, potential control, rotor regulation, or dynamic methods, according to the type of motor (*i.e.*, squirrel-cage or wound-rotor). The first four methods are well known as being suitable for small motor applications, while the last is usually restricted to larger machines of, say, 150 to 600 h.p. Each method has its respective claim to a particular application based upon the type of motor, method of control and efficiency of braking desired.

Plugging is the simplest and most effective method, consisting, in effect, of electrically reversing the motor. The value of the retarding torque will depend entirely upon the motor characteristics in the case of a squirrel-cage machine, and the amount of resistance inserted in the secondary circuit in the case of a wound-rotor unit.

With a squirrel-cage motor the value of the initial retarding torque will not differ much from the standstill value, either slightly higher or lower, according to whether the motor is of the high torque variety or of normal design. With all squirrel-cage motors, however, the current at the time of plugging will be slightly in excess of the short-circuit current, as shown in the figure. In the case of the wound-rotor motor the retarding torque and current can be regulated by varying the resistance in the secondary circuit. Suitable applications include small machine tools, steel mill motors, certain crane motions, &c. If actual reversal of the motor is not required when it has been brought to a standstill special precautions must be taken to ensure its disconnection just before zero speed is reached.

Regenerative braking is also applicable with either squirrel-cage or wound-rotor motors, and depends upon the well-known principle of running the motor above its synchronous speed. It is powerful in effect, but only within the limits of synchronous speed and over. The main advantage of this method is that it is automatic in action, economical in operation and does not require any additional switchgear. Unfortunately, this method does not bring the motor to a standstill; its chief application is in connection with two-speed motors in which the regenerative action can be turned to advantage when changing from a high speed to a low speed.

The two methods described exert a definite and positive power braking effect which is independent of the load on the motor, except, of course, in the case of regenerative braking with a single-speed motor. Excess load must be present to run the motor above synchronous speed, as might occur in the lowering motion of a crane. Nevertheless, the retarding torque is inherent above this speed, even without load, as in the case of the two-speed motor, which may be allowed to coast down from a high to a low speed under the influence of regenerative torque.

With the third and fourth methods the braking effect obtained depends entirely upon the load on the motor. Potential control is suitable for small squirrel-cage motors having a high-resistance secondary winding, so that as the primary voltage is reduced the speed (due to increased copper losses in the secondary winding) is also reduced. Similarly, in the case of a wound-rotor motor the insertion of an external resistance in the secondary circuit will provide a braking effect so long as the motor is loaded, while maintaining constant potential at the terminals of the primary windings. This is usually termed a slow-down feature preparatory to reaching the final stop, and a typical example is the electrically operated skip hoist.

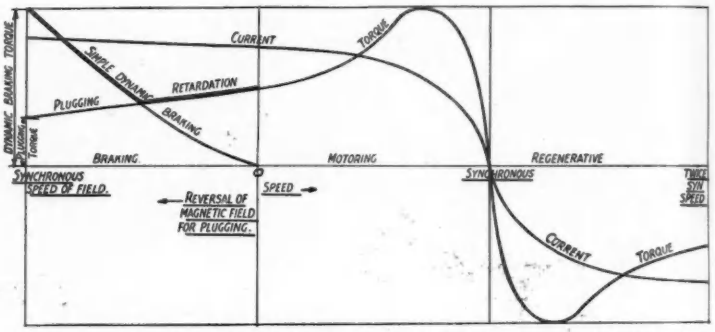
A Less Known Method

The dynamic braking of induction motors is not so well recognised, possibly on account of its restricted use. Certain applications exist, however, which require the use of constant-speed motors with means other than those already described for bringing the motor to a quick standstill. Such machines may be running for long periods, as in the case of rubber-mixing mills, and a suitable opportunity occurs for the installation of synchronous induction motors on these particular drives to fulfil a dual function, *viz.*, power-factor correction and the provision of dynamic braking, the d.c. exciter being used for both purposes.

This arrangement is convenient, as the exciter is already supplying current to the secondary winding to meet the normal running conditions and thus producing a magnetic field independent of the field produced by the primary windings fed from the a.c. supply. Thus, if the latter is interrupted the secondary circuit will maintain its own field through the exciter, thereby generating an e.m.f. in the primary windings, as in the case of an alternator.

It is, therefore, only necessary to arrange for some method whereby current due to generator action can flow through the primary circuit, which will result in a powerful braking effect being produced. This is usually accomplished by means of a resistance connected across the primary terminals immediately the a.c. supply has been disconnected which has the same effect as the corresponding d.c. motor application. The only difference of note is that the actual braking current is alternating, although the excitation is provided by d.c., whereas with a d.c. motor the nature of the current remains unchanged.

If the exciter is directly coupled to the induction motor or is driven from the motor shaft by belting or other similar means its voltage will fall with the reduction in the speed of the main motor, and the dynamic braking effect will also fall away, slowly at first, then more rapidly, depending upon the exciter characteristics. This would naturally affect the value of the retarding torque at the lowest speeds until a certain point would be reached when electric braking was practically negligible, requiring the application of a mechanical or electrically operated brake to bring the machine to a standstill. Such a course would not be suitable for the majority of cases where it is desirable to bring the machine to a standstill in the quickest possible time consistent with efficiency, and could be overcome either by increasing the exciter voltage to compensate for the rapidly falling speed or by cutting out the dynamic brake resistance in a number of steps.



Performance curves of a normal squirrel-cage induction motor; the effect of combined dynamic braking and plugging on a slip-ring motor is also shown

Separate Excitation

Notwithstanding the improvement effected by either procedure, the braking torque would still be insufficient to bring the machine to a standstill in the short time required, and the practice is to provide a separately driven exciter running at a constant speed and incorporating either or both methods. This allows for full control of the exciter voltage on the one hand and variation of the braking resistance on the other, enabling the maximum braking effect to be obtained.

An extension of the foregoing consists of employing a combination of dynamic braking and plugging, the former being used while the motor is running down from full-speed to, say, half-speed, then plugged to bring the machine more rapidly to standstill. This gives the advantage of practically uniform retardation, but requires more elaborate switchgear. Mechanical strain is reduced to the minimum, and the method is a practical proposition for the larger sizes of motor.

An Electric Furnace Development

Birmingham Electric Furnaces, Ltd., has acquired the sole rights in the British Isles for the Lindberg regulator. This instrument has been supplied previously only by the Lindberg Steel Treating Co., of Chicago, U.S.A., but will now be manufactured and sold in England under the name "Birlec-Lindberg" controller. The primary function of this instrument is the provision of a simple, accurate means for regulating the heat input to furnaces operating on electricity, gas or oil. It is available in a number of types.

Seen and Heard at the Fair

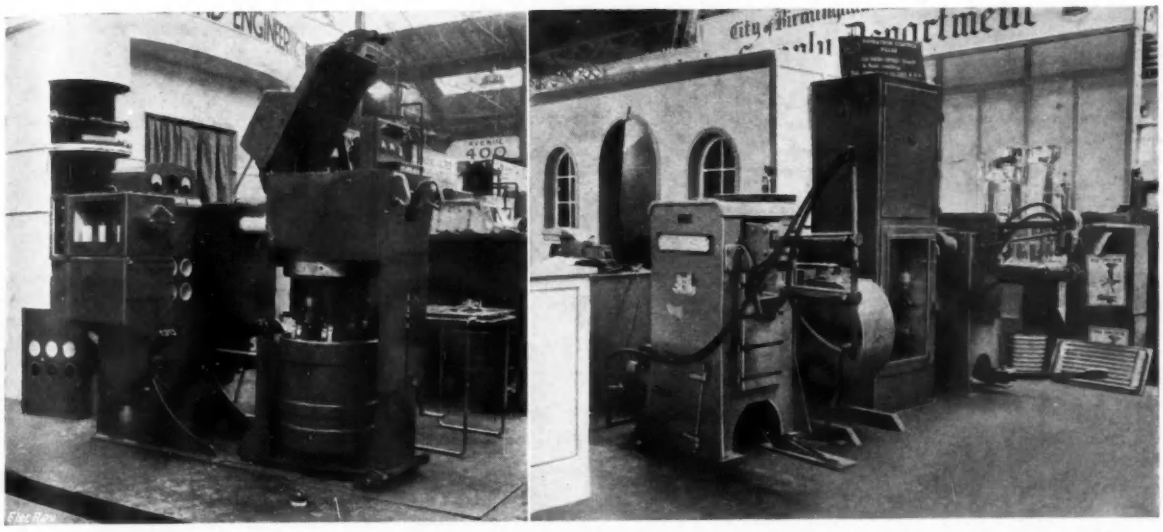
Observations during a tour of the Electrical Section

ONE good thing about the electrical show at Castle Bromwich this year is that several industrial machine makers with essentially electrical equipment are in their proper section.

An operator's view expressed on the stand of Messrs. John Shaw & Sons (Salford), Ltd., is that the introduction of electrically heated platens for their moulding presses has led to reduction of waste resulting from different temperatures between the top and bottom plattens with the older methods of heating. It was a little surprising to hear that the company does not favour automatic control; but it has its own special system of hand control through a series-parallel trolled by a foot or press switch in a convenient position.

It was good to see even a little electric foundry equipment. Pneulec, Ltd., have upon their stand a machine for producing very fine sand for facing and it is self-contained with a vertical motor drive. We noticed that one of the degreasing equipments displayed by Imperial Chemical Industries, Ltd., is electrically heated by immersion elements—so obviously the correct method.

There is not nearly enough electrical equipment among the outside exhibits, but it was pleasing to see the ease with which the electric and oil-electric excavating machines are handled as the result of the variable-voltage and variable-cur-

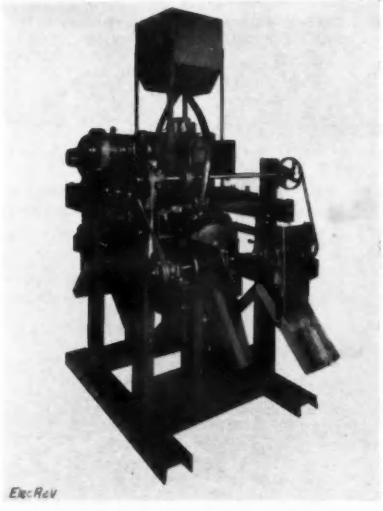


Harland 150,000-kVA extensible ring-main unit with p.t. chamber cover raised, and British Electric Welding Machines welders under "Thyratron" control

arrangement of resistances. We saw this on a 70-ton press which is loaded at 6 kW (heating).

Messrs. Thomas Locker & Co., Ltd., showed us an electromagnetic vibration feeder operating on mixed current (a.c. and d.c.) on which 3,000 vibrations of the conveyor chute per minute afford 70 tons per hour feed of gravel or sand for a ½-h.p. loading.

A big advance in magnetic separation will be brought about, it was said, by the "Rapidity" introduced by the Rapid Magnetting Machine Co., Ltd. Six to eight tons of material can be handled with a magnet load of 850 W and a mechanical load of 1½ h.p. Vibratory screening equipment produced by the Sunderland Forge & Engineering Co., Ltd., is made with various screen areas and each screen is operated by a 1½-h.p. motor. The "smalls" of two tons of dry coal is passed per hour per sq. ft. of screen area. Messrs. James Beresford & Sons, Ltd., are showing some submersible pumps with the long motors built into the unit below the turbine pump. The whole is lowered into the bore hole and the units are made in sizes for up to a 6-in. pipe line. We saw one with a capacity of 2,200 g.p.h., operating against a 139 ft. head and having a 5-h.p. drive.



The "Rapidity" magnetic separator for dealing with ores

Talking of his company's welding equipment shown on the Birmingham Electric Supply Department's stand operated by "Thyratron" valve apparatus, Mr. Jeffs (British Electric Welding Machines, Ltd.), said that "Thyratron" control permits a precision of current "dwell" and break of circuit which cannot be attained by contactor gear. Seam welding quickly spoils the contacts. At Messrs. Holden & Hunt's stand, where a very complete range of their l.p. resistance welding machines is displayed, interested visitors are invited to test the simplicity of the processes by making welded samples for themselves. A new development is an overhung long arm type spot welding machine entirely electrically operated and current system of driving with individual motors fed from a generator. The same generator and motors are used whether the primary power is public supply or oil engine.

One of the company's mining coal-cutter motors is eminently the thing for the extremely rough use on the "Joy Loader" shown working by Messrs. Mavor & Coulson, Ltd. It will gather from dump and elevate to the vehicle two tons of material per minute, and the one 15-h.p. motor moves the machine to and fro, raises the gathering head, and operates the gathering arms.

Although not official exhibits the Wilson electric vehicles, fitted specially with seats for conveying visitors round the grounds, are creating much interest.

Distribution Equipment

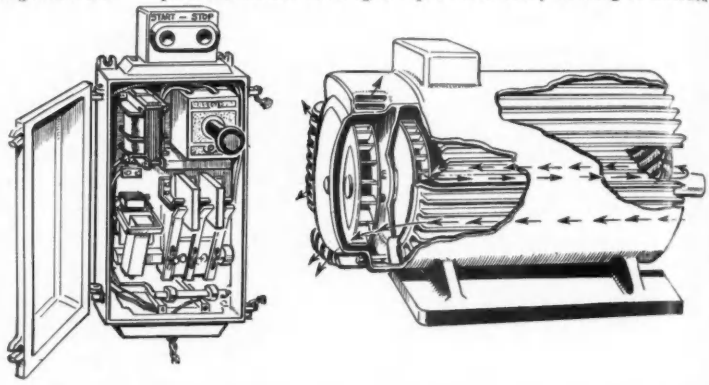
Apart from some steam equipment, notably the large Babcock & Wilcox boiler, we did not see much generating plant, but there is a fair sprinkling of distribution apparatus. Space saving is one idea behind the new 11,000-V switchgear introduced by Harland Engineering Co., Ltd., and it is claimed to be the smallest—size for size—on the market. The whole circuit-breaker and the current and potential chamber on top draws out in truck fashion for isolation and bevel and worm gear raises the whole contact unit out of the tank for examination. The bottom of the c.t. and p.t. chamber form the top of the tank, a machined face projecting from which fits into a similar face on the inside of the tank cylinder. The Harland representative said he could pull out the c.b. unit, ratchet up the top, take off the top plate for inspection of the tripping mechanism, and raise the hinged cover to inspect the current transformer, all in ten minutes.

With the internal-isolation scheme adopted by Messrs. Switchgear & Cowans, Ltd., the tank remains on the floor also. In this case the current transformers and bus-bar chambers are in section, and again time saving is claimed in conse-

quence. We were told that the c.t. unit can be changed in half-an-hour. It is a pretty good performance for one man to be able comfortably to draw out by hand a 250,000-kVA circuit-breaker unit. Drop-down isolation on a ring-main isolating unit of this make permits examination of the contacts with the ring main alive. What is, in effect, a non-automatic switching station for underground or outdoor use is built into a steel housing about the size of a large cabin trunk. It has a lift-up lid. Tramway-controller-type handles operate two outside ring-main switches and a centre tee-off switch. Recent improvements on the 11,000-V industrial switchgear produced by M. & C. Switchgear, Ltd., include a roller path for draw-out isolation and automatic shuttering of the live terminals.

Messrs. Ferranti, Ltd., are displaying their new moving-coil voltage regulator in a glass case, so that the smooth up and down motion of the coil surrounding the core can be seen. But we were more surprised to witness this operation effected by a tiny disc-type motor; the forces must be very small. A tail-end booster controlled by the current in the circuit gives a total boost of up to 6 per cent. Ferranti's stand manager stressed the advantage of the elimination of contact maintenance by the use of mercury switches in on-load tap-changing gear.

had rough factory use in mind when they designed their new industrial oil circuit-breakers. The cases are of welded steel and the spring influenced fixed contacts exert very great pressure on the moving components. Easy cabling is afforded by the removal of the top portion of the case of the wall units.

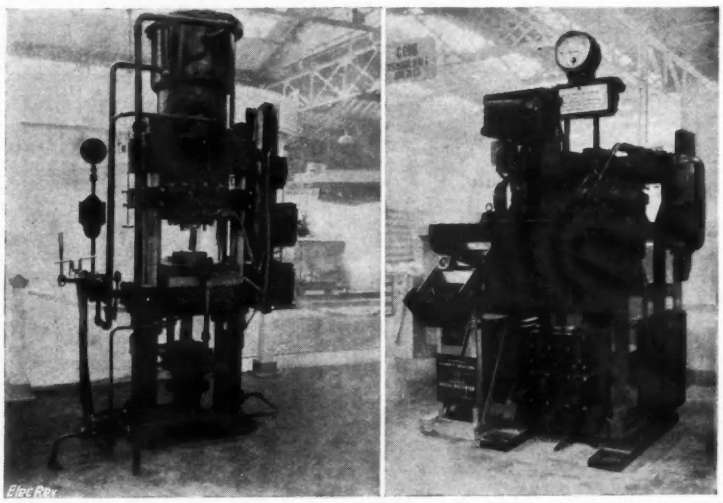


Milne & Longbottom motor starter with low-voltage transformer for lighting supply on machine tool, and cooling arrangements of "Emcol" enclosed motor

It is for those who are out for quick supply resumption by the elimination of fuses that M. & C. Switchgear have introduced a low-priced oil breaker. It is certainly a small thing for 30 A, and solid butt contacts provide for motor starting. Venner Time Switches, Ltd., have improved their time-switch controlled oil switch. Instead of direct switching the operation is now through an electro-magnet, but the real feature is that the switch is definitely locked in. It is made in sizes up to 400 A. M. & C. Switchgear make conductor-type units in three styles, ordinary ironclad, flameproof and a class suitable for severe above-ground use. We learnt that a result of the increasing above-ground inflammable industrial processes is that the company now sells more flame-proof equipment for above ground than for underground.

Messrs. Milne & Longbottom showed us their new machine-tool motor starter which embodies a 12-V transformer and fuses for a lighting supply. Not only does this make for increased safety when introducing the lighting unit close to the work, but special lighting wiring is not necessary. A lead from a pair of terminals on the unit is all that is wanted.

Incorporation of an air dash-pot was a point stressed by Mr. Donovan when referring to the improved d.c. automatic starter introduced by Messrs. Donovan & Co., Ltd., The advantage is that air does not vary in viscosity like oil. The resistance is cut out in three contact steps, and the unit is also fitted with an overload relay. The important thing about a

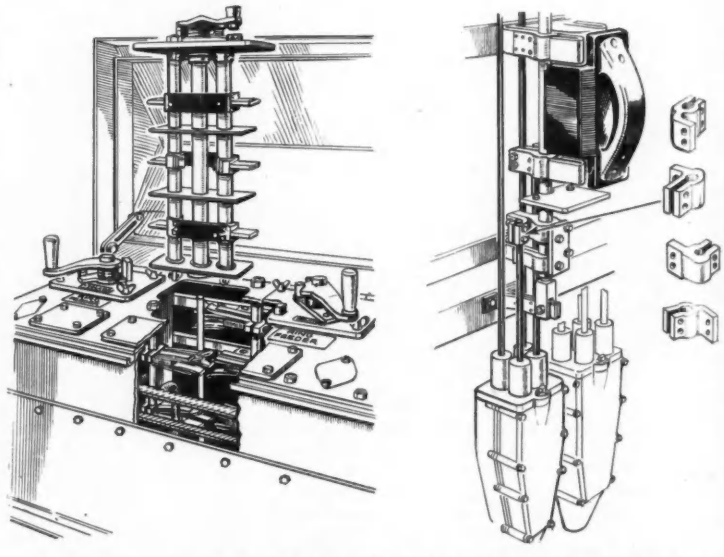


70-ton Shaw moulding press with electrically heated platens, and Reyrolle e.h.p. switch unit fitted with Westinghouse rectifier for solenoid operation

There should be relief from anxiety for a good many distribution men who have underrated circuit-breakers in sub-stations by a fuse-protecting scheme adopted by the English Electric Co., Ltd. The isolator links are cut away at the centre and the gap is filled by the E.E. cartridge fuse. Protection in this way can be given for up to 40,000 kVA, with 600-A carrying capacity. Mr. A. M. Pooley is particularly proud of his new distribution-pillar equipment. Each of the core clamps can be fixed in any of four different positions on the same lug, thus eliminating phasing out where heavy cable conductors are used. There is a feast for the practical mains man on the stand of the Cable Makers' Association. Examples of cable joints ranging up to 132-kV are displayed with the various stages of jointing exposed for visitors' inspection.

We saw very little overhead equipment, but were compensated a little by the surprise item supplied by the Better Lines Company. Indeed, it was rather startling at first to see the whole transformer of the "Safety First" sub-station, complete with the l.p. and h.p. fuses and the moving part of the switch, being hauled up the transmission pole. For the linesman this company has a roller clamp for facilitating running out conductors. Two vertical rollers guide and two horizontal rollers carry the conductor, and the unit has a screw clamp which can be fixed to any convenient support.

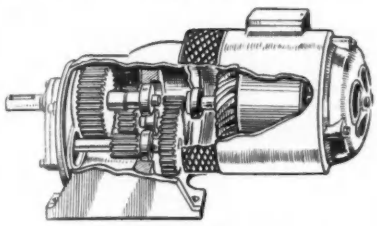
Messrs. Ferguson, Pailin, Ltd., certainly



Switching arrangements in Switchgear & Cowans underground or outdoor ring-main unit, and scheme to eliminate "phasing out" on English Electric distribution pillar equipment

new low-price float-switch with mercury cup contacts is that none of the terminal contacts move in operation. When making vain efforts to remove an internally clamped contact from the expanded links of a "Solink" isolating unit we learnt that the idea is to be extended to a cartridge fuse unit.

Referring to their miniature thermal overload circuit-breakers Messrs. Ferguson, Pailin, said that the extra initial cost of an installation is more than compensated for by increased safety factor and time saved when resetting a breaker, as against changing fuses. While this company's magnetic current limiter for wholly fixed supply charges is intended mainly for export business, it was said that there is considerable scope for its extended use in this country. There are two stages of flickering before disconnection, and there is no need to bother the undertaking for reconnection. A loop handle for easy switching-off by hook and rod is the main feature of the Simplex "Fireman's" ironclad switch for neon installation control.



Triple reduction arrangements in a Higgs geared driving unit

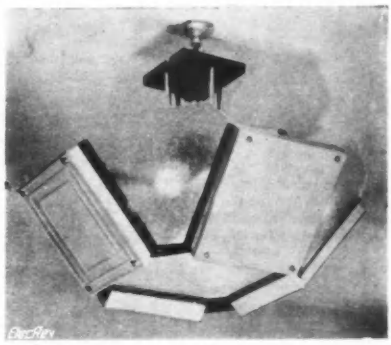
A new plug and socket combination introduced by Messrs. George H. Scholes & Co., Ltd., has appliance and lighting outlets side by side. By virtue of flat faces on the central earth plug and correspondingly on one socket inlet only the 2-A fused plug can be inserted in the particular socket. The usual 15-A and 5-A (fused) outlet combinations can be accommodated by the other socket, with, if desired, the 2-A fused plug also. While, perhaps, the unusually attractive shape and finish of the "Tenby Pilot" moulded switch introduced by Messrs. S. O. Bowker, Ltd., will be its biggest "pull," the extruded-rod movement and the wide internal spacing are useful points.

"Birlec" rocking arc furnace for non-ferrous metals

Concerning meters, the Ferranti all-bakelite case for its three-coin equipment and the substitution of the Ferraris motor by a synchronous motor for the fixed-charge unit on prepayment meters may be taken as general indications of the trend of development. The company's house-service type meters are now available in switchboard mounting cases. A simple rocking movement effects the gear change on the Venner seasonal compounds for unit changes, while the company's latest variable standing charge development provides for ½d. steps from 3d. to 2s. and 1d. steps from 1s. to 8s. It was explained that in the synchronous motor wound clock with automatic hourly correction the spring is anchored on the inside only, a friction contact on the outside providing the necessary slip. Mr. Spencer of the Sheffield Smelting Co., Ltd., showed us some new instrument contacts with a fine layer of thin metal on copper. By rolling as they approach melting temperatures the two metals are given an inseparable amalgamation, and the result is the conductivity of silver for little more than the cost of copper. Messrs. Belling & Lee gave us a very comprehensive description of radio suppression apparatus which they are putting on the market. They are obviously tackling this increasingly important subject on broad lines.

In the demonstrations of remote supervision control staged by the General Electric Co., Ltd., there is a suggestion for its application to thermal storage boiler installations. Mr. Blantern said that the modern tendency for peak-load times to vary resulted, in some cases, in the time switch becoming too limited. With the remote system the supply engineer could conveniently choose at any time at which to put energy into the boilers.

Silent running is an important aim of most motor manufacturers to-day. In the "Cylent" motor produced by Messrs. Brook Motors, Ltd., electrical hum is reduced by an increase in the frame size and by special care in winding assembly, and mechanical noise is reduced by three working surfaces in each bearing, with just a little movement to reduce friction.



Combined heating and lighting fitting for ceiling suspension (Revo)

Mr. Vaughton, of Messrs. Higgs Motors, Ltd., told us that the modern movement towards individual driving had resulted in the average h.p. per motor sold being reduced. The greatest demand now was for 2-, 3-, and 5-h.p. units. Whereas 10 h.p. had probably been the average size of motor produced, it was now perhaps 7½ h.p. Self-contained geared motor drives were becoming increasingly popular; they permitted very big reductions for relatively small increases in size. We were shown the results of efforts to standardise stator and roto units for "building in." The machine maker supplies the housing, of course, and generally the shaft as well.

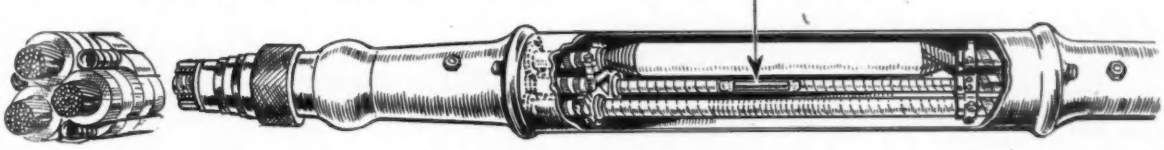
It seems that the repulsion-induction motor is losing favour in many quarters, because of radio interference, but by introducing capacitance to increase starting torque the difficulty has been overcome in many cases. We saw Brook motors with condensers mounted on the frames and larger ones with the condensers in the starting units.

Messrs. Laurence, Scott & Electromotors, Ltd., have a range of small motors fitted with internal capacitors. The scheme is very successful. Cooling of totally enclosed motors is, of course, all-important, and the duct system of "Emcol" motors, with its internal and external fans, involves very little increase in size and cost.

Brook Motors referred to clogging troubles in ducts, and they said that with the surface cooling of their totally enclosed units they could get a much smaller frame size and a reduction in cost. To see one of this company's reversing motors operating automatically with two reverses per minute without being bolted down gave us an idea of the tremendous torque generated at change-over. We saw an L.C. flame-proof motor with the mounting bracket secured by end straps, removal of which enables the motor to be rolled to the coal face.

A number of neat fractional h.p. motors of the universal repulsion-induction type is being shown by Messrs. Preston & Thomas, Ltd.

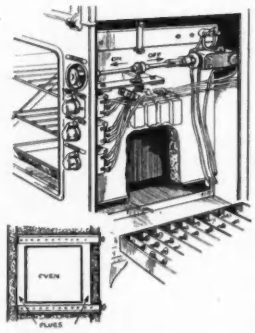
The Chloride Electrical Storage Co., Ltd., showed us a new heavy-type battery in a solid monobloc glass container incorporating a gravity indicator such as has been used lately in small radio units, and they told us of their idea of adopting the same scheme for vehicle batteries. That, however, depends on getting a suitable glass. Chloride are very pleased with their vehicle battery business and hopeful of future prospects. We heard similar references to vehicle possibilities on the stand of Westinghouse Brake & Signal Co., Ltd. Mr. Harper said the most popular vehicle unit seemed to be one



Three stages of conductor insulation and general arrangements of a 66-kV oil-filled cable joint shown by C.M.A.; arrow indicates actual conductor joint cable section on left

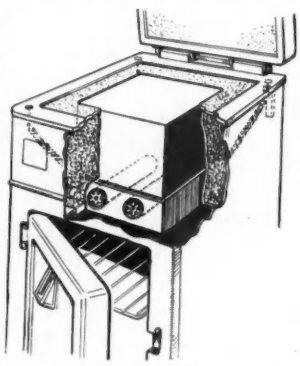
with 30 cells and 20- to 10-A charging rates. It was important to have automatic switching so that the driver could plug in and leave his van when housing it for the night.

In conjunction with the Brightside Engineering Co., Ltd., the Westinghouse Co. has developed a rectifier for chromium plating work; indeed, there is a complete equipment for this process on the stand. A Reyrolle e.h.p. switch unit fitted with one of these metal oxide rectifiers for solenoid operation is one indication of the never-ending field. We heard of a 12,500-A rectifier unit which is under construction. We saw very little electric furnace equipment, but Birmingham Electric Furnaces, Ltd., has two outstanding developments. One is a continuous conveyor-type equipment with controlled atmosphere. It is suitable for bright annealing, but its special significance is that it has permitted the process for joining steel parts together by copper brazing to be developed commercially. The model shown has a 12-in. conveyor belt of interwoven heat-resisting alloy. The loading is 25 to 35 kW and the chamber is 3 ft. 9 in. long.



Flue and automatic-control arrangements in new Creda cooker

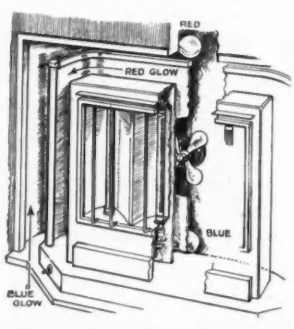
A rocking arc furnace suitable for most non-ferrous metals is claimed to be the most rapid melting furnace yet devised. A 35-lb. charge of brass is melted in 25 min. The loading is 25 kW. Two electrodes enter on the axis of the cylindrical chamber, which is rocked by a motor, the rocking being small at first and increasing automatically, so that by the time the charge is molten the rocking is full and the mixture homogeneous. A meter pivot hardening equipment shown by Ferranti's is an actual works outfit, and it is a good indication of the adaptability of the very small furnace. Pivots fed into a revolving disc at the top fall into one end of a two sectioned furnace, which is cam turned at a predetermined time. The treated pivots drop out and others are fed into the other section.



Split storage block with partial heat insulation in the G.E.C. thermal-storage cooker

Electric Tools

Ioco Rubber & Waterproofing Co., Ltd., showed us moulded insulation sheets measuring 8 ft. by 4 ft. by $\frac{1}{32}$ in. and said they were the largest sheets made. We heard of particularly rapid strides in the electric tool business. Messrs. Grimstone Electric Tools, Ltd., aim at multi-speeds with flexible drives, and we saw up to 8-speed machines. All the flexible shafts on the machines produced by Messrs. F. Gilman (B.S.T.), Ltd., are now directly insulated. Links are not used now for high-speed work. Instead there are layers of wire coiled in opposition. A new utility tool introduced by the Consolidated Pneumatic Tool Co., Ltd., serves as a hand unit for drilling, sanding and polishing, while by means of a stand it is converted into a bench grinder. Last year's bench saw shown by Messrs. David Landale now has a " big brother " with a $\frac{3}{4}$-h.p. motor and a 12-in. dia. saw, and it will cut 4 in. deep. Because of its 45 deg. tilt it is specially suitable for builders' use in cutting angle rafters.



Berry's fire with dual psychological effect and a fan

Lighting Notes

We saw considerable evidence of the fillip given to floodlighting by the Jubilee celebrations, and several companies spoke hopefully of future prospects. Briton Lamps, Ltd., showed us a projector with 200 facets. The original design was built up with individual pieces of glass, each reflecting the filament of the lamp.

It was good to hear from Messrs. Philip S. Schulman that probably not more than 2 per cent. of the coverings for wire frame shades made generally are foreign. On this stand we saw figure fittings with British alabaster bases. The call for " something different " is reflected in the 700 colour samples of " Erinoid " which we saw displayed by Messrs. FitzGibbon & Co., Ltd. Perhaps the novelty of the Fair is the sailing boat lighting fitting shown by Messrs. Arthur J. Pepper. Polished sails form wing reflectors for the tubular lamp. A table lamp displayed by Messrs. L. G. Hawkins & Co., Ltd., has an adjustable vertical standard knuckle joint at one end of the arm and a ball joint at the other end.

Among the sign fittings displayed are the " Circalite " sohwn by the British Thomson-Houston Co., Ltd., which has two half-circulator lighting tubes and scintillator in its base, and the decoration unit shown by Rodlite, Ltd., in which light from a back enclosure is projected endwise through glass rods resulting in a picture of spots.

Loop immersion heater in Bulpitt wash boiler

New Cooker Ideas

A new thermal-storage cooker introduced by the General Electric Co., Ltd., has the two sections of the storage block partially heat insulated, so that what would otherwise be heat exhaustion of the block by boiling leaves the smaller bottom section at high temperature for the oven. In a semi-storage model the block is devoted entirely to boiling and there are a 1,500-W grill and top oven element and a 1,200-W bottom oven element.

There are both home and colonial features in the new cookers introduced by the " Wyndham " Cooker Co. Some models have separate grilling chambers, and we saw both " Chromalox " and rewireable closed plates on the same cookers. Kettle plugs are incorporated in some of the vertical models, and automatic oven control is adopted on table models. The thermostatic indicator is favoured against the thermometer. The latest cooker introduced by Messrs. Moffats, Ltd., has a warming chamber, but the grill is still in the oven. One cooker has two small English Electric cooker we saw an open protected boiler griller. The Falkirk Iron Co., Ltd., has a small cooker with switches and fuses placed centrally on the front between the warming cupboard and the oven, and on the stand of Messrs. Albert Phillips Co., Ltd., we saw automatic oven control on a vertical cooker and a breakfast cooker fitted with a combination switch-plug.

Simplex Electric have adopted the external oven elements idea in their new " Creda " cookers. There is a flue right round the oven and main and auxiliary elements are inserted with this at the bottom and top, respectively. Automatic oven control is available with a rotary setting pointer at the normal switch position. Pulling out the handle switches the oven on at a little less than low heat. A new " Creda " boiler-griller has element bars covered with stainless steel inverted channels with lips which clamp the bars at the bottom. For control where both appliances are not permitted on circuit simultaneously the company has a change-over control unit.

Displayed by Messrs. Hendersons are a control unit with an anti-vibration pilot light and a mechanical indicator unit. The Rheostatic Co., Ltd., has a cooker thermostat for automatic oven control. Built into the back of the oven it is coupled up to the switch plate at the cooker front and acts as an " off " switch in the extreme position.

Premier Electric Heaters, Ltd., have redesigned their old " Multi-boiler " table appliance. It still has an open element but the spiral is nested in a fire-clay base with drainage holes. The hot-plate and stainless shield lift off completely for access to the elements. Messrs. Bulpitt & Co. show their " Gothic " ware tea service set which is complete with an electric kettle. This company has extended its kettle loop immersion heater to wash-boiler use.

Heating Equipment

On all sides we heard of the rapid growth of the demand for inset fires. We saw a Premier sheet-metal surround with no fixing lugs. It hangs on to an angle plate bracket screwed to the wall, a lip on the surround fitting into a recess on the bracket. A new Ferranti panel fire for flat wall fixing can be lifted off the panel and used as a portable equipment.

Psychological effect is back again with renewed vigour, this time to suggest low as well as high temperature. Messrs. Berrys Electric, Ltd., have a reflector fire with vertical elements and two semi-circular reflectors arranged triple-concentrically at the back of the fire proper. The intermediate reflector conceals two red lamps which produce a warm glow

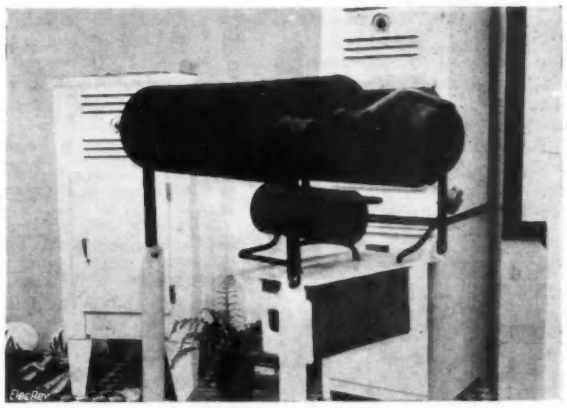
around the equipment, while inside the back reflector blue lamps suggest cooling in hot weather. Further, air circulation is afforded by a fan inside this outer reflector.

Messrs. Chance Brothers, Ltd., explained some of the many uses of glass-silk heat insulation. It is vermin proof, and we saw "Rayrad" panels made up in pad form for backing ceiling and wall heaters, and mattresses for water heaters. A Revo combined heating and lighting unit has four 600-W panels, built along the lines of the company's wall panel heaters, interposed with four glass panels, all arranged for oblique downward projection. The unit is designed for five 100-W lamps.

The results of Mr. Haussauer's research on anti-scaling are the outstanding water heating development. In the sealed element tube is a special plastic material which liquefies on heating without deterioration and affords quick heat transmission to the tube container. The large emission area of this tube results in a lower surface temperature, and consequently in troublesome scaling elimination. Dripping is overcome by a telescopic inlet tube, the top of which is lowered automatically to the water level when the tap is opened.

A move by Simplex to eliminate furring is the adoption of larger-bore and straight outlet pipes. Attention is also given to accessibility and component spacing on the apparatus plate. On this stand we saw for the first time a 1½-gal. rectangular unit. Mr. Gough, of Messrs. P. B. Sillimanite, Ltd., told us that "Sillimanite" is now being used for water heating immersers. Continued tapping as the tube is filled with powder fixes the element rigidly and tightly in the tube. The wrong grade of powder for the appropriate size of tube results in inefficient packing. While there is little new in refrigerator design and construction, notable exceptions are the "Zeros" absorption type refrigerators introduced by Messrs. J. Ismay & Sons, Ltd., which make an excellent display, and the comprehensive range of equipment shown by the Pressed Steel Co., Ltd.

In a new vacuum cleaner produced by Bylock Electric, Ltd., the machine terminals are fixed directly on the motor frame and are accessible through the bakelite machine casing by a rubber bushing. A hand vacuum cleaner shown by Messrs. L. G. Hawkins & Co., Ltd., is provided with a reinforced-rubber nozzle.



Zeros absorption-type refrigerator unit, without elements

Views and Suggestions

Speeches at official luncheons held at Birmingham

ADDRESSING representatives of the Press at the Fair last Friday, Mr. T. J. Kennedy, president of the Birmingham Chamber of Commerce, said that in 1921 the Fair grounds covered an area of nine acres and there was 85,000 sq. ft. of exhibition space. During the past fifteen years there had been nine extensions, and this year the area of the grounds was 50 acres while the exhibition space totalled 274,000 sq. ft.

The layout of the Fair was now on the most modern lines, enabling buyers to inspect all the exhibits with the greatest of ease. The Fair included products from all parts of the Empire, and special efforts had been made to secure the interest of trade associations. This year no fewer than seventy such associations would pay official visits.

Addressing the representatives of foreign newspapers who were present, Mr. Kennedy said that he wished to stress the international character of the Fair. Although this country had been compelled to adopt a modified system of protection it was still the greatest buyer in the world of foreign goods. They should have no diffidence in recommending their countrymen to buy British goods, for in doing so they were helping their best customers. It was an insane theory that imports could be restricted while exports were expanded.

The Fair and the Convention

Over 250 people were present on Tuesday at the official luncheon presided over by Mr. Percy Plant, when official visits were paid to the Fair by many of the leading bodies in the electrical industry. These included the Councils of the I.E.E., I.M.E.A., E.D.A., B.E.A.M.A., E.W.F., E.C.A., and also representatives of the Incorporated Association of Electric Power Companies, the Provincial Electric Supply Association, the London Electricity Supply Association and the E.C.A. of Scotland. The Lord Mayor of Birmingham, welcoming the electrical men, expressed the hope that their active support of the Fair would be reflected in corresponding financial benefit to themselves.

The chairman drew attention to the more spacious layout of the stands and the wider gangways allowed. This year's Fair, he said, was the biggest yet held, indeed the biggest of its kind in the world. It would provide a wonderful tonic to industry. The number of foreign visitors had broken all records, and the visit of about thirty-five delegates from Poland on Monday indicated a likelihood of the continuation of orders placed by that country in Great Britain as a result of the visit of a similar delegation three or four years ago. Mr. Plant referred to the presence of Mr. Maconochie (chairman of the Australian Tariff Board), Mr. Dalton (Senior Trade Commissioner in Australia), Mr. Harpur (Victorian Electricity Commission), and Sir Archibald Page (chairman, C.E.B.).

Mr. E. E. Hoadley (president, National Electrical Convention, and president of the I.M.E.A.) proposing the toast of "The Electrical Industry," said, in his introductory remarks, that after reading over the week-end the comments in an electrical journal he felt that he ought almost to apologise for being in Birmingham. He had been told that the National Convention was treading on the toes of the Fair. [Our words were "One coming on the heels of the other."—Eds., E.R.] It had been fully realised after the alteration in the date of the Fair that there should be as long an interval as possible between the two events, but owing to the incidence of Whitsuntide and to the difficulties of booking accommodation at seaside resorts, not more than one week's interval had been found practicable. [We think Mr. Hoadley means a week-end, not a week, as the Fair closes on Friday, May 31st, and the Convention opens on the following Monday, June 3rd.—Eds., E.R.]

Turning to the main subject of his address, Mr. Hoadley said that most of those present expected to sell something through the Fair. He was there to sell co-operation. In his long connection with the electricity supply industry he had found that the many sound threads in it were pulling from different angles instead of being woven together to give the utmost strength for pulling in the same direction. What was the use, he asked, of the various parts of the industry fighting each other when all their efforts should be devoted to fighting the common enemies. He offered the sincere co-operation of the I.M.E.A. with all other bodies in the industry.

He had been struck recently by the number of willing people in the electrical world: those willing to work for the good of the whole and those willing to let them do so; the former he estimated at half the latter. If the Bournemouth Convention proved to be the beginning of better things, he would be satisfied with his part in it. Some mistakes were inevitable at the beginning of everything, but the first object should be to give the National Convention a proper trial.

Mr. A. Albrecht (director, E.W.F.) pledged the support of his organisation, representing a purchasing power running into millions, in full support of the National Convention. After trying it out at Bournemouth, possible improvements could be discussed.

Dr. A. H. Railing referred to the electrical industry as a "hydra" which had the advantage given by its many heads of speaking with several tongues and acting with one body. In the electrical industry we were coming to learn more and more that sectional interests must give place to the interests of the whole. In expanding employment and increasing exports the industry had more than held its own. It had been able to keep a well-paid staff together and had spent more than £500,000 in research during the past twelve months.

Power for Canadian Mines. By F. H. Fullerton

A British Columbian scheme which is part of a major development

GOLD mining activities in the Bridge River area of British Columbia have created a demand for power which is being met for the present by a hydro-electric development recently completed by the Bridge River Power Co., Ltd. The scheme is part of a larger project planned for future undertaking and in connection with which the two and a half mile tunnel used for the present plant was bored through Mt. Mission to connect the Bridge River valley with Lake Seton.

The tunnel was completed in 1930 at a cost of $1,700,000 and took three years to build. At first work was started on boring a 12-ft. circular tunnel, but later it was decided to increase the bore to the equivalent of 14 ft. 3 in. circular section (actually it is of horseshoe shape). The bore was entirely lined with concrete ranging in thickness from 7 in. unreinforced to 14 in. where reinforced, and 24 in. near the portal. A gradient of 7.3 in 1,000 provides for a flow of 2,100 cu. ft. per sec.

When the tunnel had been constructed the anticipated industrial demand for power in Vancouver and district did not materialise owing to the trade depression, and the plans for erecting plant with an initial capacity of 54,000 h.p., and ultimately 600,000 h.p., were held in abeyance.

Temporary Plant

In 1933 a mining boom started in the Bridge River valley and it has been maintained. The resultant demand for electricity has induced the supply company to install a small temporary hydro-electric plant to serve this need until such time as the initial unit of the major development can be proceeded with. The set now in operation has been so designed as to cause the minimum of inconvenience when the major development is continued. Apart from serving the existing need it will supply power for construction work on the larger development.

[By Courtesy of the Agent General for British Columbia

Lake Seton, British Columbia, which has been connected with Bridge River by a 2½-mile tunnel for the purpose of a hydro-electric development

Water is conveyed to the tunnel by a canal dug from the Bridge River to the intake and is drawn through a 22-in. steel pipe for delivery to a turbine on the shore of Lake Seton under a head of about 1,000 ft. At the outlet end of the tunnel a steel bulkhead was installed in the concrete lining and to this the penstock is welded. At this bulkhead a 20-in. automatic gate valve actuated by water pressure is designed to close automatically in the event of trouble arising in the penstock. By placing the valve in the tunnel there is no danger of freezing, while the storage of water in the tunnel assures actuating pressure. The penstock is of welded plate construction 2 ft. in diameter and tapering to 22 in. at the lower end. It is 2,700 ft. in length and required 230,000 lb. of steel plate. The pipe, which is capable of withstanding over 500 lb. pressure per sq. in., was electrically welded in Vancouver and shipped in 30 ft. sections.

As the tunnel and its intake are submerged in the canal pumping will be required only during eight months of the year at the most. During the two-thirds of the year when pumping is necessary the pressure required to bring the water through the canal from Bridge River into the tunnel is supplied by two 18-in. screw impeller pumps of 30 cu. ft. per sec. capacity. They are directly connected in each case to 40-h.p. motors, and have been installed on the lower cross beams of the existing gate cylinder at the tunnel intake. The maximum pumping head will not exceed 10 ft.

The generating set was originally installed at the Jordan River hydro-electric station of the British Columbia Electric Railway Co. (which controls the Bridge River Power Co.) on Vancouver Island. The 4,600-h.p. horizontal single overhung Pelton-Doble tangential impulse wheel is directly connected to an Allis-Chambers-Bullock 2,300-V a.c. generator. The exciter has a capacity of 100 kW and is mounted on the same shaft as the 150-h.p. induction motor and a 100-h.p. waterwheel. Oil operated " Lombard Q " type governors have been installed.

The power house is of temporary construction on concrete foundations with a concrete tailrace emptying into Lake Seton. The generator pressure is raised to 60,000 V by three 1,400-kVA oil-insulated and water-cooled transformers, which have also been transferred from the Jordan River plant.

Four and a half months were required to clear the right of way for the transmission line, the construction of which over the rugged and mountainous country was the most expensive part of the project. In all 120 miles of 0.5-in. aluminium cable was used, with a steel strand to give it strength. The line is of the single 3-wire circuit type on cedar poles, spaced at 150 ft., and extends from the power plant to the load centre of the mining field, a distance of about forty-three miles. Pin-type insulators are used.

When erecting the line it was necessary to carry the wire across the river at a time when it was not practicable to use a boat. This difficulty was overcome by flying a kite across with a fine but strong twine. When the kite was secured on the opposite shore a light rope was attached to the twine and this, in turn, hauled over a heavy rope to which the cable was attached. The highest point reached by the transmission line is about 4,000 ft. above sea level.

The initial connected load was 1,500 h.p., the Bralorne mine at the extreme end of the line taking 800 h.p. in addition to the output of its own plant built two years ago. The Bradian and Bralorne mines are fed at the moment from the same substation, but more transformers now on their way from the east will be used to provide a separate substation for the Bradian mine, and the combined capacity of the two sub-stations will be raised to 2,000 h.p.

The Bradian mine is operating 250 h.p. of electric motors. Indications are that the property will be fairly quickly developed, and when the milling stage is reached a good deal more power will be required.

At the Pacific Eastern gold mine a comprehensive development plan is to be carried out. For supplying this property an extension of the transmission line from Bradian and the erection of a transformer sub-station are under way. The B.R.X. mine has an initial connected load of 300 h.p. of motors which are largely used for compressing air. It proposes to continue shaft sinking and to open up at least two mine levels in the immediate future.

The present Bridge River project was carried through very rapidly. The first actual work, other than the tunnel, was commenced in March, 1934, with the clearing of the right-of-way for the transmission line and was completed at the end of June, test runs being made early in July. The work was under the direction of Mr. E. E. Carpenter, consulting engineer and chief of the Construction Department of the British Columbia Electric Railway Co., which has its head offices in Vancouver.

Water Power in Latvia

IN the course of a recent report submitted to the Department of Overseas Trade (published by the Stationery Office, 1s. 6d. net) Mr. J. P. Trant, Commercial Secretary at the British Legation, Riga, says that the hydro-electric power plant at Kegums on the River Daugava, which has been so long under contemplation, is expected to take material form this year as the Government proposes to embark upon the undertaking with its own resources. The question has become an urgent one as it is estimated that the existing Riga electric power plant, which has a capacity of 35,000 kW, will after 1937 no longer be able to supply the needs of the city unless supplementary equipment is provided. The city of Riga at present consumes over 80 million kWh per annum and the consumption is increasing every year by about 15 per cent.

The projected plant at Kegums would have a capacity of 75,000 kW, and could produce 120 million kWh per annum. It would cost in the neighbourhood of 30 million lats and would take from 2½ to 3 years to complete. A proposal has been put forward by the Municipality of Libau to construct a power plant at Kuldiga, on the river Venta, where there is a natural waterfall. The cost of the plant is estimated at 1,500,000 lats, and it would have a capacity of 8,000 kW, which would supply nearly 80 per cent. of the energy required for lower Kurzeme. The Municipality of Rezekne has also a project for constructing a water-power plant to supply the needs of the district.

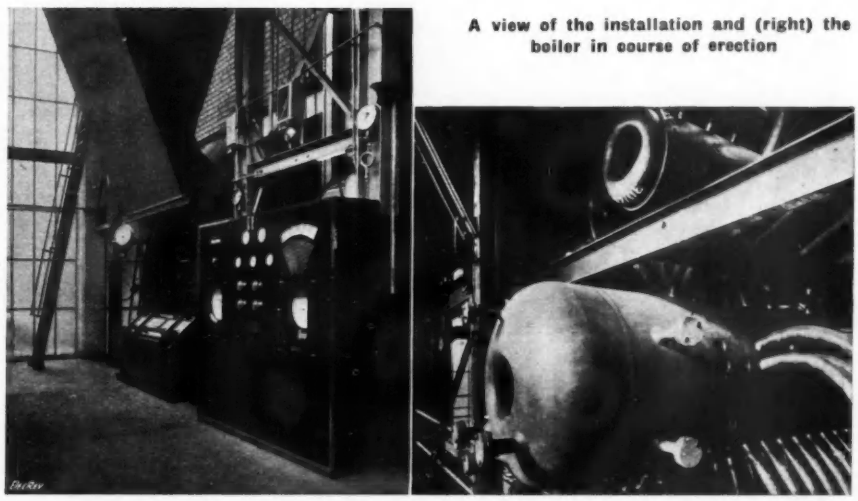
A Welded Drum Boiler Installation

PROCESS steam used in the essence distillery of Messrs. W. J. Bush & Co., Hackney, is exhausted and bled from a non-condensing turbine geared to a 250-kW d.c. generator, the output of which is also used in the factory. There is a 170-kW Diesel-electric generating set as a stand-by.

The latest addition to the boiler house, which has been in commercial service for about six months, follows generally the design of the plant previously supplied by the Borsig A.G. It is unusual in that it consists of a single bank of nearly vertical tubes connected to an upper and a lower drum. It has a heating surface of 2,750 sq. ft., corresponding to an actual evaporative rate of 7.3 lb./sq. ft. per hr. at maximum rating.

The normal output is 15,000 lb. per hr., the pressure 415 lb. per sq. in., and the temperature 650 deg. F. Feed water enters the main steam and water drum near the ends, thus supplying the down-take tubes direct at the ends of the drum. These tubes are not exposed to the gases, but are protected by being built into each of the side walls and therefore provide a positive feed to the bottom drum.

All the tubes forming the actual heating surface are thus steam risers. The first line consists of half a row only to form a slag screen, and both this and the next row of tubes are exposed to the radiant heat of the furnace and discharge above the water level into a baffle trough having openings at the ends, thus allowing the steam generated in these tubes time to separate from the entrained water in the mixture. In addition to this, further separation of the moisture is obtained by passing the steam into the receiver drum directly above the steam and water drum.



A view of the installation and (right) the boiler in course of erection

A 675 sq ft. M.L.S. superheater is at the back of the boiler tubes after the first pass, a " B. & W." 1,086 sq. ft. economiser of the cast iron gilled tube type, and an " Usco " 1,120 cu. ft. air heater.

The fuel is a mixture of coal (Scotch washed singles) and works refuse comprising vegetable waste from the distilleries, straw, paper and wood chips, from a hogging mill. The refuse is mixed when entering the coal elevator and on the roof of the building it is further mixed before passing to the boiler down a single chute.

The calorific value is 11,000 B.th.u. per lb. The refuse contains about 30 per cent. of moisture and has a calorific value of about 5,500 B.th.u. per lb.

An Underfeed " L " type stoker was selected with a modern archless setting, combined with the use of overhead air, introduced through ports in the front wall by a booster fan which deals with approximately 30 per cent. of the total combustion air at maximum load.

This boiler is claimed to be the first to operate in Great Britain with drums of entirely fusion welded construction. A company has insured the plant without any increase in the normal premium.

The process of manufacture was observed by a surveyor of this company, assisted by one of Lloyd's surveyors. The drums were constructed for International Combustion, Ltd., by Messrs. Babcock & Wilcox, Ltd. After bending the shell was formed with one longitudinal seam weld. The end plates used were formed in the usual manner and attached to the shell by a circumferential weld. As there are no British rules for this type of construction the manufacture was carried out according to the regulations laid down by the American Society of Mechanical Engineers' Power Boiler Code.

Both longitudinal and circumferential joints are of the double welded butt type. The weld metal was deposited in layers and care taken that no valley or groove was left along the edge or in the centre of the weld. Two destructive-test specimens were taken from the joint and the weld metal, and a bend-test specimen was taken transverse to the welded joint. All longitudinal and circumferential seams were examined by X-ray or gamma-ray methods and their acceptability was judged by comparison with a standard set of radiographs issued by the Boiler Code Committee.

After the completion of welding the drums were stress relieved by heating them uniformly to 1,100 deg. F. for a period of time based on at least one hour per inch of thickness, and then allowed to cool slowly in a still atmosphere. They were next subjected to a pressure test of 900 lb. per sq. in. and vigorously hammered whilst under pressure.

The mountings and valves were manufactured by Messrs. Dewrance & Co., Ltd., and Gummers, Ltd. The feed water regulator is of Messrs. Copes' high pressure tension type and " Ivor " soot blower equipment is fitted. The forced and induced draught plant is of Messrs. Howden's design, all regulation being controlled by the Hagan system of automatic control supplied by Messrs. James Gordon & Co., Ltd.

Individual Drives. By S. A. Wallis

THE modern factory tendency is to use self-contained electrically driven machines in place of the group drive as a means of speeding up of production. Whether this transition is economically sound depends on factors, many of which are rarely considered by planning departments. At the moment no hard and fast rule may be applied to gauge the advisability of changing over to unit machines. The user would, however, benefit considerably from closer co-operation between motor manufacturers and machine makers.

Often a new unit machine may displace perhaps two or three older ones forming a group driven by one motor, the result being that some load is taken from the single-motor group thereby reducing the power factor and efficiency of the motor. The load factor of a group drive is far more constant than that of individual drives, owing to the wide limits of full load and no load of motorised units.

It is assumed that a self-contained unit is a faster worker and, therefore, a heavier cutter than the group machine. If this were not so it could hardly justify itself, being more costly. The loading with a large number of units will make a relatively large maximum demand, and a further point to be considered is the fact that machine tool manufacturers invariably specify a motor of larger h.p. per machine than is required for group drive. Except when high-speed motors are used, the efficiency and power factor per unit are low, and on the average they are lower than for the similar type of load on group drive.

Where motorised units are concerned it would be a good plan to incorporate in the control gear a small condenser, varying in capacity to suit the motor concerned, which would be connected across the stator terminals of the motor and thus introduce a leading kVA to compensate for low power factor when running light. It would also considerably help when starting by tending to smooth out the voltage drop at the moment of switching on. This would be especially advantageous with star-delta starting, as the maintenance of voltage would have a beneficial effect on the starting torque.

Provision is rarely made on any one panel for isolating a single circuit; the whole panel must be made " dead " for any adjustment to local circuit. Although this is not an extremely important point there are occasions when single-circuit isolation would be a distinct advantage.

Fuses are quite a debatable feature of control units. To confine the whole panel to one set of fuses, which must be capable of withstanding the starting currents of all motors, can hardly be called a safeguard, rather is it a means of total isolation. On most control panels the operating coils are in circuit across two phases, and should the third phase become

dead the motors would remain running, with consequent damage to the windings.

Some makers of control gear are seriously taking up this point, but until it is universally rectified it will be decidedly a matter for serious observation. Local fuses for single motors might save a motor from being burnt out when the operating tools become faulty by jamming, &c. I have actually known the shaft on a small unit, such as a single horse-power motor, to shear instead of tripping the switch or blowing the fuses controlling the complete machine.

Indicator lights are rarely provided to show when concealed motors are still running, and it is feasible to expect that an operator of a machine may be injured or the machine damaged by not being aware that his motor is still running. Quite a good idea is to incorporate a box with a glass front over the machine to give the operator some light, at the same time telling him by stencilled words "Motor running."

Local Lighting

All unit machines should have, as part of their equipment, low-voltage local lighting provided by a transformer across the line voltage and giving an output at not more than 25 V to the lamps. Here again the absence of means of completely isolating the transformer is very noticeable. The unit may be switched and fused, but cannot be completely isolated unless some other method of doing so is employed.

A distinct advantage of the unit machine is that no attention has to be paid to line shafts or countershafts, and the machine may be installed wherever a supply can be taken. Also, the elimination of belts and overhead shafting is a very good point with unit machines, but unless this is carried out over a reasonably large area no material benefit can be claimed. A complete shop of motorised units gives an ideal condition for shop lighting, since absence of belts and shafting allows the illuminating engineer to give of his best.

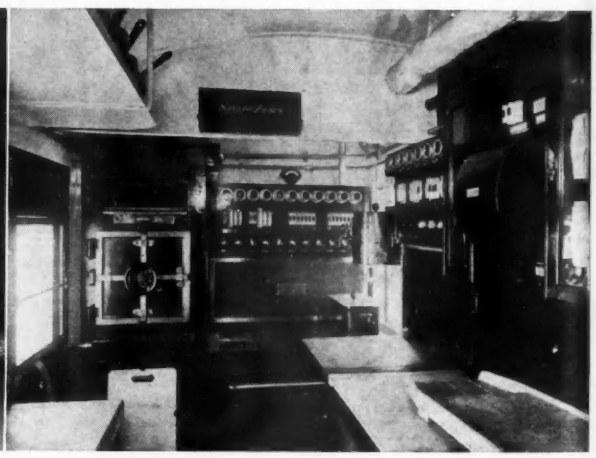
Maintenance of group drives is generally higher than that of unit machines, because the shafting and belting need constant attention. This does not necessarily mean that contactor panels may be closed and forgotten; occasional routine inspections will be necessary to keep all contacts so far as is possible free from burns and pitting.

From a production point of view it is evident that an expensive unit machine must have an extremely high load factor, otherwise its depreciation, &c., will outweigh the advantages over the old style of machine belt drive, which can easily afford a lower load factor because the depreciation is lower and the contribution to the overall load factor is a much smaller percentage.

Generally speaking, when the aim is to provide ultimately a roomy, light and healthy workshop motorised units are indicated, conditional upon these and other factors being given due consideration.

Electric Cooking on a Railway

IN the two all-electric restaurant cars recently put into service by the London & North-Eastern Railway Co., the cooking range is fitted transversely at the end of the kitchen; a roasting oven, with steaming oven, grill, and boiler above it are on the left, and beside it is a boiling range with six hot-plates and a boiling pan with 7-gal. vegetable steamers. At the corridor side of the kitchen, between the serving hatches is a hot cupboard. A frying pan is fitted at the end of the hot cupboard, covered when not in use by an extension of the top of the latter.

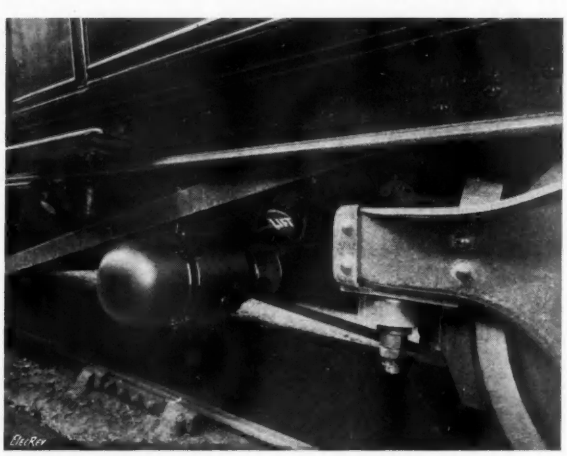


Left: The dining saloon, and (right) a view of the kitchen

Two hot-water tanks of a total capacity of 90 gals., with heating elements clamped to their undersides, are fitted in the roof of the corridor beside the kitchen. From these tanks the boiler on the oven range and two 2-gal. tea urns are supplied. Preliminary cooking and water heating can be carried out at terminal stations without heavy demands on the storage battery, connecting sockets being provided on the underframe for taking energy from the station supply.

While the train is under way the supply is provided by two 7.2-kW dynamos, with self-contained automatic pole-changers carried on the underframe, and belt driven from the bogie axles; a battery takes up the load during intermediate stops. Output is regulated by the Stone adjustable dynamo suspension system, and automatic cut-in and cut-out switches, and a battery overcharge-preventing switch are installed.

The battery comprises ninety 175-Ah cells. Subsidiary boards are provided for each main group or important element of the apparatus, carrying separate switches for the control of the heat of individual elements. On each side of the main switchboard are two pairs of fuses for the main groups, and there are subsidiary fuses for the individual elements.



One of the dynamos providing electricity for the kitchen

The wiring is carried in enamelled screwed conduit and particular attention is paid to the earthing of all frames and casings of the various cooking apparatus. The plug connections for the electricity supply from the station mains are interlocked with a valve on the train pipe, a lever with disc controlling this valve being so placed that while the plug is connected the valve must be open and a vacuum cannot be created in the train pipe.

The special advantages of cooking by electricity in a railway train are the purer atmosphere and the much more comfortable temperature compared with that of a gas kitchen with its noxious fumes, and the elimination of fire risk involved in the use of gas. The electrical equipment for these cars was supplied by Messrs. J. Stone & Co., Ltd., Deptford, "Carron" cookers being used.

Correspondence

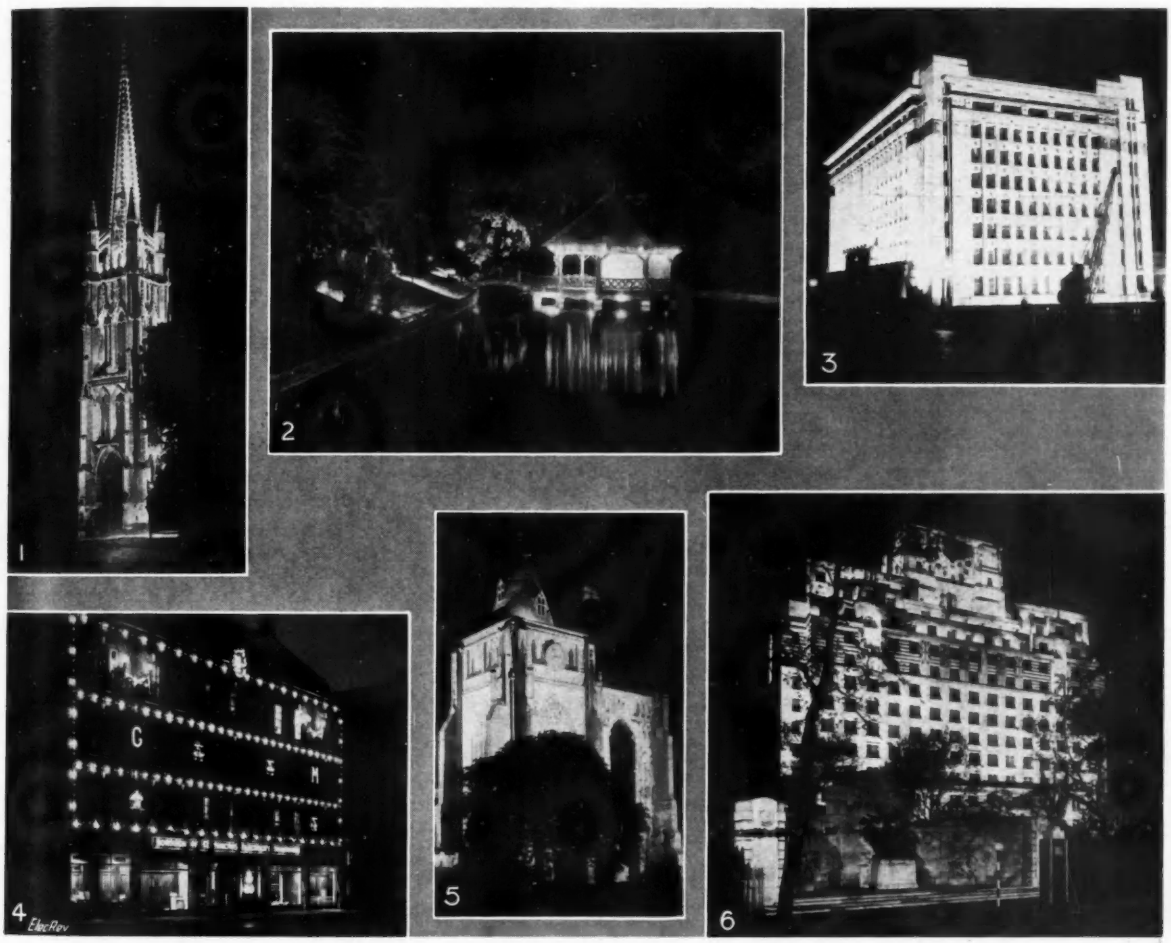
Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession

Power Station Efficiency

In your Correspondence columns last week "Grid" referred to some anomalies in the official method of evaluating the performances of power stations in terms of thermal efficiency or pounds of coal burned per kWh. He quite rightly pointed out that what matters is the cost per kWh, but surely the work entailed in obtaining and correlating comparable overall costs per kWh (which should be on a "sent-out" basis not on a generated basis as at present) including capital charges, wages and maintenance, would unduly delay the publication of the Commissioners' Fuel Returns and thus considerably reduce their value. It is, moreover, always possible that coal obtainable locally might be more economically burned at a power station some distance away that was favourably situated with regard to condensing water.

The relating of efficiency to system or station load factors, advocated by "Grid," would not always be satisfactory, as *plant* load factor, and the shape of the output curve must be allowed for. It is a mistake, however, to attach too much importance to the "League table" aspect of the Fuel Returns, as their main object is not to award points of merit to engineers operating the more modern stations. They serve a much more useful purpose in indicating broadly whether plant design, steam conditions and the sites selected for base load stations are those most conducive to low costs.

May 22nd. STOKER.



Further Examples of Special Jubilee Lighting

1. The 147-ft. spire of St. James's Parish Church, Louth, Lincs. (total height 294 ft.). 2. The bandstand and lake, Bromley, Kent (Falk, Stadelmann). 3. Adelaide House, London, E.C.3 (Kandem). 4. St. Pancras electricity showrooms. 5. Crowland Abbey, Lincs. 6. Shell-Mex House, Victoria Embankment (Edison Swan).

The Magnetic Field

In reply to Dr. Clayton, may I say that I have not ignored the experimental evidence which he takes to be a proof of the "line-snapping" theory. I have not had a chance to consider it, for he has not put it before me. I think it very probable, however, that the connections which he used to obtain this evidence changed the conditions, causing an e.m.f. to be generated in accordance with Neumann's varying linkage theory, and I would remind Dr. Clayton that there is no evidence for "line-snapping" even in a slotted armature.

Making the coils of his machine free to slide on the rotor ring would not provide any confirmation of the BIL formula. The coils would probably move up to one of the yokes under the action of a force equal to $I\, d\phi/dx$ (I=current in c.g.s. units and assumed constant and $d\phi$ is the increase in linked flux due to a displacement dx). A further movement of the coil would necessitate movement of the armature. This would not occur because it would not increase the flux linked with the coil.

A similar formula, torque $=I\, d\phi/d\theta$ where $d\theta$ is angular displacement, tells us that Clayton's machine would fail as a motor because $d\phi/d\theta=0$. On the other hand, the BIL formula says that a very large torque would be exerted.

Dr. Clayton is wrong in thinking that Blondel disproved the varying linkage theory. In his experiment there was no time variation of the flux linking each turn; the e.m.f. induced in each turn was zero and unwinding turns off the magnet would not affect the value of the e.m.f. In any case, Dr. Clayton in his letter of 1915 said: "In every known case correct results can at once be obtained from the formula $e=-N\, d\phi/dt$."

In reply to Prof. Howe, I am not aware of the "many misstatements" in my last letter, and I am not making a misstatement when I say that Dr. Clayton's machine should have worked according to the teaching on pages 55 and 196 of Prof. Howe's translation of the book by Thomalen (5th edition).

In my opinion, the root cause of all the wrong teaching is the mistaken belief that the amount of flux cut must equal the change in flux linked with a circuit. Because of this, the BIL and BLV formulæ are in several text-books faultily derived from other laws.

In a previous discussion on expanding circuits Prof. Howe said: "The type of problem to which Mr. Hargreaves refers has been treated at length by Dunton, Ruhle and others." Dunton and Ruhle found that the e.m.f. induced in an expanding square circuit, carrying a constant current, is 85 per cent. greater than the flux cutting theory leads us to expect. As the current is constant, and no iron is present, there can be no possibility of e.m.f.s being induced by magnetic lines snapping or moving across conductors.

With regard to Faraday, I am inclined to agree with one writer who suggests that Faraday did not fully appreciate the real nature of his discovery. I hope your readers will not rely on the dictates of authority when considering this question. I shall be pleased to discuss the subject by private correspondence with anyone who is interested. C. HARGREAVES.

11, Leyburne Street, Bradford, *May 19th.*

The Need for More Publicity

As a consumer of both electricity and gas for domestic purposes I have many opportunities for comparing the publicity efforts of the two undertakings which serve me.

I reside in a London suburb and I am constantly receiving copies of well-produced publicity literature printed attractively in colour, regarding various gas appliances, including boilers and refrigerators, from the Gas Light & Coke Co. Electrically I am supplied by the municipality. I have lighting, fires, vacuum cleaner, iron and all-mains wireless; though there are a number of other important services that electricity could render, I never receive any literature from the Electricity Department. Can anybody say why? I cannot imagine that a large competing electricity company would let the Gas Company have things so much its own way. PUZZLED.

May 20th.

Dwelling-house Floodlighting

I have noticed with pleasure the photographs that you have already published of large and important buildings floodlighted for the Jubilee celebrations, and it occurs to me that the accompanying photograph of a last-minute effort on my part to floodlight my house illustrates what can be done with the smaller type of suburban dwelling and may be of interest to your readers.

The public is under the impression that floodlighting is an expensive form of lighting, more especially for large buildings,

The floodlighting of a suburban residence

but the cost of installing and running a system for a house of the type illustrated is actually quite small.

Three 100-W 240-V lamps with small aluminium reflectors were used; they were wired in parallel from a garage inspection lamp plug. These projectors can be equally well adapted for garden or tennis parties, and the lighting of rose pergolas or ornamental ponds. If controlled from the house they could also be used to prevent unwelcome visitors approaching the house with the intention of breaking in.

Hinchley Wood, Surrey. *May 14th.* JOHN A. JEFFERY.

Testing Motor-car Engines Electrically

A COMPLETE new electrical plant has been installed at the Longbridge Works, Birmingham, of the Austin Motor Co., Ltd., for the running-in and testing of 2,000 engines (aggregating 33,000 h.p.) per week. These testing sets have been manufactured and supplied by the General

A number of the testing sets installed at the Austin motor works

Electric Co., Ltd., and they are grouped in two lines of twelve, with two situated separately for testing sports engines with a maximum speed of 4,500 r.p.m. Of the twenty-four sets half are for testing 10-h.p. and the other half for 12-h.p. engines.

Each set comprises a d.c. machine (used either as a motor or a generator), a directly coupled tachometer and a control pillar. The assembled engines are brought to the testing department on an overhead conveyor track and lowered on to one of the test beds. Petrol (3,000 gal. per week) and oil are fed to the engines from a central supply, and five special generators provide energy for ignition.

The testing machine first drives the engine at a low speed to run it in. The ignition is afterwards switched on and the engine drives the machine, which now automatically acts as a d.c. generator, feeding energy back into the supply mains. The engine is then run up to higher speeds to obtain normal working temperatures, the generator automatically absorbing the output, which is indicated on a horse-power meter. Up to this point the engine has been running for two hours.

Next the speed is reduced to a low value in order to make adjustments. The engine is then tested over the whole speed range at full throttle and the horse-power is again returned to the mains. During this test the output and speed of the engine are shown on an ammeter (calibrated in h.p.) and an electrical tachometer. A 10-h.p. unit is expected to develop fully 20 h.p. before it can be passed.

In order to obtain a fine speed adjustment the a.c. works supply is converted to d.c. at 220 V by a 500-h.p., 500-r.p.m. synchronous motor-generator.

The speed range of the testing machines on load is 1,000/3,200 r.p.m. The adjacent control pillar contains a d.p. isolating switch in the base, a d.p. ironclad line contactor, a push-button operated face-plate starter, and a main shunt-wheel regulator, together with a vernier shunt-field regulator for giving fine speed regulation. Overload and over-speed relays are also provided, while push-buttons at convenient positions operate a dynamic braking contactor. A tumbler switch for controlling the ignition, an ammeter calibrated in horse-power, and a speed indicator complete the equipment embodied in the control pillar.

When the starter is returned to the "stop" position, the ignition circuit is tripped (as well as the main contactor) to prevent racing of the engine. In emergency the operation of a push-button mounted close to the engine brings the machine to rest quickly by means of dynamic braking.

The two high-speed testing sets function similarly, but are fitted with heavy shafts to raise the critical speed well above the maximum running speed, while the commutators are reinforced with steel rings shrunk into position over micanite insulation. A resistance incorporated in the control system enables the machines to be run at low speeds on load and then changed over to the line.

Instead of an ammeter calibrated in horse-power a compensated wattmeter is used so that the horse-power of any engine within the range tested can be indicated accurately irrespective of the varying speed losses in the testing machine.

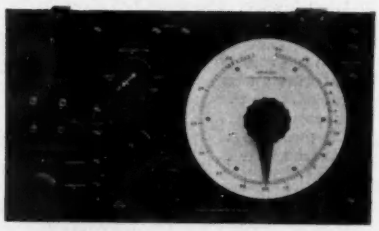
New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

Measuring the Conductivity of Solutions

The CAMBRIDGE INSTRUMENT CO., LTD., 45, Grosvenor Place, London, S.W.1, has designed a bridge for the direct measurement of the conductivity of solutions ranging from distilled water to strong salt.

The bridge is provided with a calibrated dial, switches for range, change-over and "on" and "off" control, and a battery and telephone detector. The dial has a scale approximately 41 cm. long graduated from 0.25 to 3.0 units. The range switch has scale factors marked in white for resistance (1, 10, 100, 1,000, and 10,000) and in red for conductance (1, 0.1, 0.01, 0.001, and 0.0001). The complete range is thus from 0.25 to 30,000 ohms or 0.000025 to 3 mhos. The change-over switch enables the appropriate resistance or conductance values to be selected. A self-contained dry battery feeds a reed hummer fitted inside the instrument case and thus gives an a.c. supply of approximately 900 cycles per second to the bridge; balance is detected by a sensitive single telephone supplied with the outfit.



The Cambridge conductivity bridge

Accuracy over the entire range is claimed to be within 0.5 per cent. With the majority of solutions and using well platinised electrodes, balance to within 0.3 per cent. is obtainable. The dimensions are 30 cm. by 23 cm. by 18 cm., and the weight 7.3 kg.

Ornamental Electric Fireplaces

Novelty is the keynote in the design of the new range of fireplaces of MESSRS. W. N. FROY & SONS, LTD., Brunswick Works, King Street, Hammersmith, London, W.6. Perhaps the most elaborate design is type I.H.8, a bureau suite with walnut fittings and an ebonised top and strips, the surround being of lunel rubane marble. There are two 1-kW electric fires, a cupboard and draw-out tray with cocktail fittings, strip lamps, electric clock and a five-valve Midgeley-Harmer radio-gramophone.

Three new Froy fireplace designs: Nos. I.H. 22, 24 and 13

A lower priced model is type I.H.13 which embodies a walnut mantel and black ebonised skirting with cupboard and bookshelves, an electric clock, one 2-kW fire and a four-valve radio receiver. The front is orange Varois marble. Nos. I.H.22 and 18 have a similar mantel and skirting and a 2-kW fire, but in the first case Greek cippolino is used for the marble front and in the second Algerian onyx. Light Swedish green marble, with surround of rose aurore with a whitewood mantel for painting, are features of model I.H.24. Again there are a 2-kW fire and shelves and books.

A Large Capacity Battery

A dry battery known as the "Drydex Challenger" has been introduced by the CHLORIDE ELECTRICAL STORAGE CO., LTD., 137, Victoria Street, London, S.W.1, to cover the range of 60, 100, 108 and 120 V, and to replace the corresponding "Red Triangle" range. The tappings are the same as before, and the only difference in dimensions is an increase from 2¼ in. to 3⅞ in. in height, but the capacity of the "Challenger" is approximately one-third greater. When discharged at 10 mA for 3 hours per day, 7 days per week, to 0.75 V per cell, the battery is claimed to function for 211 hours.

Testing the Colour Constancy of Materials

To determine the colour constancy of textiles, paints, lacquers, &c., it is necessary to employ a source of light of much higher intensity than sunlight, at the same time having the same characteristics and effects. The apparatus which PHILIPS INDUSTRIAL, 145, Charing Cross Road, London, W.C.2, is introducing for testing colour-constancy has a rapid operating speed and, unlike sunlight, is ready for use at all times. It has the further advantage of being constant. Thus it is possible, when examining materials for their colour-constancy, to take measurements which can be reproduced accurately.

The apparatus comprises a water-cooled cylinder containing a 750-W lamp of a shape similar to that of a cinema lamp, with the lower part made of quartz glass. With the aid of a reflector in the cylinder this lamp gives an intensity of illumination of about 5,000,000 lux (about 500,000 ft.-candles) on a copper table, also cooled by water, bearing the sample to be examined. The light-intensity is approximately fifty times that of the sun on a fine summer day. It is claimed, as a general rule, that if materials have been exposed to the light of this apparatus for one hour and do not show any alteration in colour, they can be considered colour-constant.

The colour-testing apparatus

In addition to the water-cooling mentioned above, the apparatus is also equipped with a cooling fan which prevents excessive heating, even when testing very thick tissues. The apparatus is fed by a transformer with a rotary resistance by which the current is kept constant at 50 A. The copper table can easily be turned away from under the apparatus for the purpose of examination or replacement during irradiation. The illustration shows the lampholder, the water jackets surrounding reflectors, &c., the ammeter (indicating lamp current), the coarse and fine adjustments for lamp current and the switch for the fan motor.

Plug and Adaptor Switches

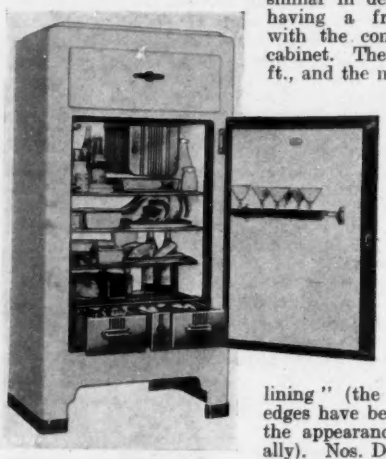
The lampholder adaptor and a two-pin 5-A plug each incorporating a push-switch, which are made by MESSRS. WARD & GOLDSTONE, LTD., Frederick Road, Pendleton, Manchester, 6. should interest the manufacturers of small portable electrical appliances. The switch-bars have coloured ends to indicate whether they are on or off. In the case of the lampholder adaptor, a sample of which we have examined, the switch has a rapid movement, and the mechanism is housed in a porcelain interior, this material

"Goltone" lampholder adaptor

also being used for the cord grip. There are screws through the two brass contacts, which hold the interior rigid and at the same time serve to carry the current from the switch to the contacts.

Modern Refrigerators

During a visit to the showrooms of the Lightfoot Refrigeration Co., Ltd., at Bush House, Aldwych, London, last week we saw a range of improved domestic electric refrigerators which has been extended to include a small model with a food storage capacity of 3½ cu. ft. This refrigerator is similar in design to the others, having a front opening door with the compressor above the cabinet. The shelf area is 5 sq. ft., and the model is 3 ft. 11½ in. high, 1 ft. 10½ in. wide and 1 ft. 11 in. deep. Four and a half pounds of ice in 44 cubes can be made at one freezing. The exterior is finished with lacquer on steel.



The new "Westinghouse Streamline" DLX.95 refrigerator

Among the other models the most noticeable improvement is in the "streamlining" (the corners and sharp edges have been rounded off and the appearance improved generally). Nos. DLX-67 and DLX-78 have a folding shelf in the door, and a neater design of cold control switch is now used on all models.

The DLX-95 is an interesting new model which combines all the latest refinements. There is a salad crisper, dairy basket, fruit bin, a special revolving shelf which allows articles at the rear of the cabinet to be obtained without removing those at the front, a chilling tray, a "handy-jack" ice tray release and the usual automatic door-operated light. A 1⅛ h.p. motor drives the compressor. There are 15.9 sq. ft. of shelf area and 9.5 cu. ft. of storage space, while the ice-making equipment is capable of freezing nearly twelve pounds of ice in 116 cubes.

All the refrigerators are available with an exterior coating of "Dulux," a new hard finish introduced last year, while the larger models of the series may also be obtained with a porcelain finish.

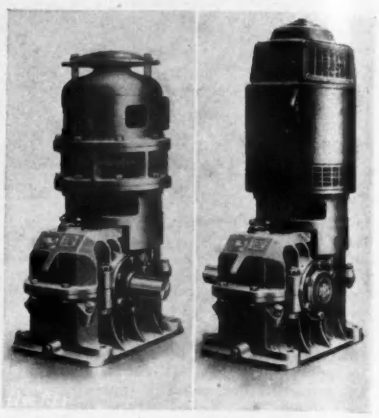
A Tube Bending Machine

A new product of Messrs. Fry's (London), Ltd., 24-25, King Street, London, E.1, is the "Apex" bending machine. It has a cast-steel body with formers of cast-iron, a square thread screw and handles of malleable iron. The machine has been designed mainly for tubing, but rods and bars can also be bent. Galvanised pipes may also be treated without damage to the galvanising.

Worm-geared Motor Units

A new range of worm-geared a.c. and d.c. motor units put forward by the British Thomson-Houston Co., Ltd., incorporates gear boxes with reduction ratios of 5 to 1 up to 50 to 1, or higher.

The electric motor is spigoted and bolted to, and thus forms an integral part of, the gear casing, giving a mechanical alignment that is unaffected by lack of rigidity in the foundations and reducing weight and space occupied. The worm gears are Messrs. David Brown's "Radicon" high-duty pattern. The worms are of nickel steel and the worm-wheel rim is of centrifugally cast phosphor bronze. The worm-wheel shaft is of forged steel machined all over, and the journals are finished by grinding. The design is such that the low-speed shaft can be brought out on either side or both sides of the casing.



A 20-h.p., 50-r.p.m., d.c. geared motor unit incorporating 20 to 1 ratio 10-in. gear, and a 10-h.p., 30-r.p.m., a.c. geared motor unit incorporating 25 to 1 ratio 8-in. gear and squirrel-cage motor

Cooling is effected by a fan situated just below the upper worm-shaft bearing which directs the air stream from top to bottom of the casing ribs. The bearings are ball and/or roller, accurately fitted. A flexible coupling connects the motor to the high-speed (worm) shaft. The motor has its own grease-packed bearings; thus the high-speed revolving element is carried in four bearings. The bottom half-casing forms an oil-reservoir into which the worm-wheel dips and is thus continuously lubricated.

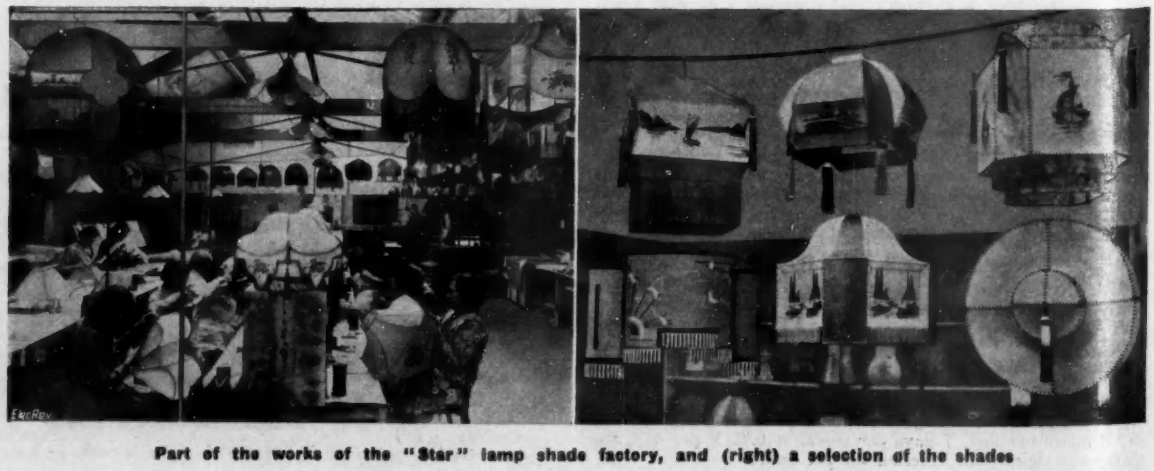
The gear boxes are made up in six sizes—4 in., 6 in., 8 in., 10 in., 12 in., and 14 in. The following percentage efficiencies relate to an 8-in gear box at 1,450 r.p.m. input for various ratios:—5 to 1, 96.25; 10 to 1, 95; 15 to 1, 93.5; 25 to 1, 90.5; 50 to 1, 83.5.

Wire-frame Lamp Shades

THE type of lamp shade with a covering on a wire frame has of late become increasingly popular. During a recent visit to the works of the Star Lamp Shade Manufacturing Co., Kilmorie Road, Forest Hill, London, S.E.23, we observed the moderate prices permitted by modern synthetic and other covering materials and the simplicity of construction of such shades.

From the artistic point of view all tastes are catered for, while there seemed to be shades for every purpose—in the home, from the kitchen to the drawing room, and others for the workshop, store and public hall. We saw shades measuring only 4 in. across and others 4 ft. in diameter. Mr. J. Owen (co-proprietor), who is responsible for all the designs, showed us shades which are made specially for use in covering the top parts of inverted bowls, so keeping the bowl interiors dust free.

The wire frames are built on jigs to afford precision fitting of the covering and trimmings, and inaccuracies are further guarded against by hanging the coverings in specially heated compartments. The outstanding attraction of the equipment is, however, the artistic designs stencilled on the covers. We saw many of the original drawings and paintings by Mr. Owen from which the stencils are made, and we viewed with interest the "multiple" stencilling processes by which any desired combination of colours can be introduced into one design.



Part of the works of the "Star" lamp shade factory, and (right) a selection of the shades

Assisted Wiring. By W. Phœnix, A.M.I.E.E.

The value of prepayment meters in making schemes more acceptable

SINCE the passing of the 1926 Act and under the stimulus of the reports of the Electricity Commissioners most supply authorities have introduced schemes of assisted wiring. The success met with has varied greatly according to the principles on which the schemes have been based and to the amount of publicity given to them. Many authorities have developed schemes which, in their opinion, are most suitable for their own particular undertakings, but I feel that such a method is wrong and that schemes should be drawn up to suit the consumer.

To achieve this object the "minimum installation" should be as small as possible, while the period of repayment should be long enough to reduce the running costs to a figure permitting participation by the poorest. No doubt such a suggestion will be met by arguments that such consumers are unprofitable, but experience has contradicted this.

Obstacles to the Quarterly Scheme

Up to the present the assisted wiring scheme adopted by the majority of undertakings appears to be that providing for quarterly payments, which is the first obstacle in the way of its acceptance by the poor who are compelled to live a hand-to-mouth existence. Another obstacle is often found in the authority's insistence on plug points in the minimum installation. With very poor consumers this is tantamount to adding unnecessarily to the cost of the installation, since the plugs are seldom, if ever, used, and can readily be added later.

It should be remembered that the traditional entry of electricity into the domestic field was the lighting supply, and many people still require to be convinced of its value for other purposes, except possibly radio reception, which may ultimately come to be regarded as an electrical service greater even than lighting. In any case, an authority should only be concerned with the plain considerations of economics and service to the public. If a minimum installation shows a profit the provision of such a service is justified. Time, experience of electricity and educational propaganda should do the rest.

The prepayment meter solves the problem of how to reach these classes of people mentioned and of assuring to an undertaking its payments over a long period. Some authorities, pioneers in this class of business, began with the ordinary straight prepayment meter, adding a penny or so to the "unit" charge until a required number of kWh were consumed. The limitations to this method are twofold. First, the flat rate tariff is enforced on the consumer, who is thereby discouraged from using electricity extensively. Secondly, the period of repayment varies with the rate of consumption and a good consumer is compelled to pay back at a higher rate than a worse consumer. Steps are sometimes taken to overcome these inherent objections. For example, when a consumer has used more than a specified number of kWh a rebate is given of the pence paid on excess kWh, but this procedure entails careful attention to the periods of meter reading and consequent calculation of rebates.

To overcome the flat rate difficulty efforts have been made to collect a sum per kWh calculated on an estimated quarterly consumption at two-part tariff costs, but here again there may be "shorts" or "overs" at the final collection, and the former are not always dealt with easily. It is not suggested the difficulties are insurmountable; they are probably just irritating. In any case, however, the schemes are inelastic to new or revised conditions.

Fixed-charge Prepayment Meters

In my opinion the type of prepayment meter most adaptable to the requirements of a supply authority is the two-part tariff kind with the fixed charge mechanism operated by a synchronous motor. A ready adaptation of ordinary prepayment meters to this principle is the addition of a fixed charge collector, and this is, I believe, proving a success wherever tried.

Either method provides for the utmost elasticity and any tariff can be offered. Fixed charges for wiring or appliances can be metered accurately without assumption or estimated probabilities. The consumer can avail himself of the full facilities offered by the undertaking and the charges are made as precisely as though an account were rendered.

These are very important factors for ensuring happy relations with consumers, especially in areas where the class of consumer catered for by these meters is found in compact, "gossipy" districts. The precision with which a consumer can be informed that the meter will demand, say, 1s. 6d. per week plus ½d. for every kWh consumed is readily appreciated and understood by most people.

Up to the present few authorities have adopted this class of meter to the fullest extent, but those which have done so report only success from its application.

A Comparison

After several such meters had been in practical service (collecting arrears) for the better part of a year in the Newton-in-Makerfield undertaking's area of little more than 5,000 houses an assisted wiring scheme with a first payment of 6s. and 1d per point per week for a period of five years was introduced and from the start was highly successful. From February, 1934, to the end of March last, 755 installations were carried out under this scheme, whereas in the case of a quarterly scheme providing for repayment in three years the number of installations carried out from April, 1932, to the end of March last was only 139.

[*Birtles, Warrington*

Mr. W. Phœnix is engineer and manager of the Newton-in-Makerfield Electricity Department

The district is a highly industrialised one which has suffered, and still suffers, severe depression. I believe that the progress in this area is sufficient to show that the assisted wiring scheme affords even the poorest an opportunity of good and healthy lighting. Also, while lighting is most popular the facilities for heating and cooking are not overlooked and the smaller appliances such as irons have been in considerable demand. All such appliances are charged for through the meter, as also are the costs service cable in the few cases where such a charge is entailed. Another point of interest which arises is that every consumer obtained on the assisted wiring scheme elected to be charged on the two-part tariff. It is admitted that the available flat rates are high and they have been maintained so, but the point of importance is that a minimum annual fixed charge of 30s. is imposed under the two-part tariff.

The popularity of the scheme has raised electricity to a prominent place in the public eye and has increased the sale and hire of appliances and the sale of energy to unexpected heights.

Capital Costs

With regard to the capital cost of the scheme there is first the assisted wiring which is met out of loans and the revenue is ample to meet all such charges. That then is an asset, not a liability, for although the scheme is planned to show a small margin of profit it is nevertheless a safe margin.

Secondly, there is the cost of the meter which is certainly high; this is again met by a direct charge of 2d. per week payable through the meter

Last, there is the cost of mains and services, sub-stations and plant, or a proportion thereof. These figures have been carefully watched month by month to ensure that they do not rise excessively, and the results have been surprisingly satisfactory. Allowing for extra plant, &c., which has become necessary due to the increase in consumers but which is not yet purchased, and for the cost of mains and services laid in the past year, it has been found that the total expenditure per service connected is comfortably below £10. It will be obvious that much of the assisted wiring has been done in streets where mains were already laid.

Altogether 1,169 installations were connected during 1934-35, of which 250 were new houses, the rest being made up of assisted wiring scheme consumers and those who were induced by the rush of popular feeling to have their homes wired by private contract. When it is considered that the total number of consumers at March 31st, 1934, was only 1,899 and this was raised in twelve months to 3,068, it is possible to form an idea of the "craze" for electricity which has filled the district during the year.

These things, I claim, justify the contention that an electricity supply authority can meet its moral obligation to supply the poorer classes in their own peculiar way and at the same time make such business economically sound. In the course of time when installations are paid for and meters can be set back to collect smaller sums per week in consequence, the consumers will have been educated to appreciate electricity and it will be up to the sales staffs to persuade them to use it for other purposes.

British Overseas Electrical Trade

Another favourable month

PERHAPS the most satisfactory feature of the Board of Trade returns for April from an electrical viewpoint is the continued expansion in our exports to South Africa and Australia. Compared with April last year the value of shipments to these two markets improved by 66 and 91 per cent. respectively, or a total increase of £149,000.

From the accompanying tables it will be seen that the total value of our exports during the month was £1,024,451, which is £211,077 (26 per cent.) more than in the corresponding month of 1934, when there were a similar number of working days, namely, twenty-four. Compared with March last the total is down by £6,000, but in that month there were twenty-six working days, so that the figures may be regarded as quite satisfactory.

It is interesting to notice that while our exports of lighting apparatus reached a high level, far fewer foreign lamps were received in this country. There were no signs of a falling off in the demand for telegraph and telephone apparatus, and exports of cable, unenumerated goods and switchgear were also gratifying.

The chief destinations of some of the more important items in the goods and apparatus section during April were as follows, comparative figures for April, 1934, being given in parentheses :—

Rubber insulated wires and cables.—South Africa, £23,859 (£11,009); Australia, £21,777 (£12,026), British India, £12,509 (£9,267); New Zealand, £4,678 (£2,672); other British countries, £13,577 (£9,772); foreign countries, £10,397 (£8,488).

Electric wires and cables (insulation other than rubber).—South Africa, £24,803 (£8,109); Australia, £13,309 (£8,630); British India, £12,238 (£23,035); other British countries, £12,847 (£8,373); foreign countries, £21,236 (£9,430).

Telegraph and telephone apparatus (other than radio).—Australia, £21,392 (£6,059); South Africa, £18,474 (£14,377); Canada, £911 (£436); other British countries, £27,186 (£16,273); Argentina, £7,723 (£5,520); other foreign countries, £48,105 (£22,512).

Imports were less than in April, 1934, by £421, the greatest reductions being in lighting apparatus and radio receivers.

EXPORTS AND IMPORTS DURING APRIL

	Exports. April, 1935.	Exports. Inc. or dec. compared with April, 1934.	Imports. April, 1935.	Imports. Inc. or dec. compared with April, 1934.
Submarine telegraph and telephone cables	£2,000	+ £768	*	—
Telegraph and telephone wires and cables (not submarine)	29,406	− 18,946	*	—
Other insulated wires and cables	171,230	+ 58,419	£13,518	− £2,865
Radio receivers (not radiograms), excluding valves	15,307	− 4,411	10,558	− 17,788
Radio transmitters (excluding valves)	13,048	− 8,858	*	—
Radio valves	29,048	+ 4,816	9,301	− 3,945
Other radio parts and accessories	39,751	− 4,176	51,597	+ 10,238
Telegraph and telephone apparatus (other than radio)	123,791	+ 58,614	—	—
Electric carbons	*	—	16,568	+ 2,890
Incandescent lamps	47,681	+ 12,096	8,745	− 20,769
Other lighting apparatus	43,846	+ 16,604	21,015	− 1,223
Primary batteries	12,284	− 3,777	443	+ 149
Accumulators	34,693	+ 8,397	*	—
House service meters	12,509	+ 1,035	*	—
Other electrical instruments	15,086	− 1,420	23,553	+ 5,151
Unenumerated electrical goods and apparatus	128,148	+ 28,123	58,673	+ 9,266
Electric generators up to 200 kW.	18,687	+ 1,433	*	—
Electric generators over 200 kW.	33,108	− 5,945	*	—
Electric motors	81,339	+ 15,589	29,825	+ 15,716
Convertors and transformers	48,478	+ 9,756	*	—
Starting and controlling gear for motors	22,208	+ 2,320	*	—
Switchgear	91,268	+ 36,625	*	—
Other electrical machinery	11,535	+ 2,015	4,887	− 4,102
Electric vacuum cleaners	*	—	21,431	+ 6,861
Total	£1,024,451	+ £211,077	£270,114	− £421

* Not classified separately. † Not railway and tramway motors.

Vacuum cleaners came from Canada, £7,406 (£2,431); United States, £6,324 (£2,275); Sweden, £3,293 (£5,062); Germany, £1,484 (£2,041); other foreign countries, £2,924 (£2,739).

BRITISH ELECTRICAL EXPORTS DURING APRIL

Destination.	Goods and apparatus, April, 1935.	Inc. or dec. compared with April, 1934.	Electric generators, April, 1935.	Inc. or dec. compared with April, 1934.	Motors, April, 1935.	Inc. or dec. compared with April, 1934.	Other electrical machinery, April, 1935.	Inc. or dec. compared with April, 1934.
Irish Free State	£21,455	+ £3,577	*	—	*	—	*	—
Union of South Africa	129,416	+ 45,545	£18,832	+ £16,796	£24,904	+ £16,758	£64,277	+ £13,704
British India	86,583	+ 1,997	4,552	− 31,893	13,400	+ 5,477	32,584	+ 11,404
British Malaya	17,245	+ 7,934	*	—	*	—	6,671	+ 4,643
Ceylon	11,781	+ 6,701	*	—	*	—	*	—
Hong Kong	6,944	+ 1,006	*	—	*	—	*	—
Australia	100,857	+ 44,911	5,305	+ 4,066	6,542	+ 2,328	4,132	− 1,523
New Zealand	46,964	+ 20,702	*	—	1,560	− 222	5,118	+ 50
Canada	7,939	+ 2,471	790	+ 590	4,471	+ 2,290	1,227	+ 542
Other British Countries	54,620	+ 5,038	10,927	− 2,331	15,283	− 7,178	22,876	+ 12,210
Sweden	7,497	− 1,017	*	—	*	—	*	—
Denmark	17,140	+ 6,742	*	—	*	—	*	—
Belgium	7,622	− 2,019	*	—	*	—	*	—
France	11,028	+ 933	*	—	*	—	5,253	+ 3,253
Spain	5,420	− 2,125	*	—	*	—	*	—
Italy	2,142	− 2,612	*	—	*	—	*	—
Greece	2,990	+ 744	*	—	*	—	*	—
Egypt	19,975	− 10,151	*	—	*	—	3,721	+ 2,594
China	13,065	+ 3,153	*	—	*	—	2,867	− 4,409
United States	1,943	− 121	*	—	*	—	*	—
Argentina	27,009	+ 11,388	*	—	2,693	+ 2,147	899	+ 347
Soviet Union	*	—	—	− £1,075	354	− 4,068	90	− 185
Netherlands	*	—	117	+ 117	*	—	1,393	+ 427
Other Foreign Countries	118,193	+ 4,487	11,272	+ 4,556	12,132	− 16,299	22,381	− 7,659
Total	£717,828	+ £149,284	£51,795	− £4,512	£81,339	+ 15,589	£173,489	+ £50,716

* Not classified separately.

The chief sources from which the goods were obtained, with comparative figures, were as follows :—

Electrical goods and apparatus.—Germany, £54,340 (£48,337); Netherlands, £53,378 (£39,345); United States, £39,963 (£56,432); British countries, £21,210 (£11,574); Switzerland, £12,339 (£11,913); France, £10,609 (£11,768); Austria, £5,485 (£7,844); Belgium, £5,254 (£9,211); other foreign countries, £11,393 (£36,443).

So far this year the total value of our electrical exports has amounted to £4,267,144, which is £847,536 (20 per cent.) more than in the corresponding four months of 1934. Imports have amounted to £1,054,500, an advance of £88,220 (8 per cent.).

German Electrical Developments

IN a recent address to the Pomeranian Elektrofachkreise, Direktor Krecke referred to the beneficial effect on employment of the "Electrical Front" established in 1933, and of the A.F.E. organisation, subsequently formed with the co-operation of manufacturers, dealers, supply authorities, and workers, for the furthering of electrical interests. According to *Die Wärme*, a new campaign has now been launched to secure the more extensive use of electricity for heating purposes. More than 400,000 persons are at present employed in German electrical work, over half in the electro-technical industry and about one-fifth each in hand-work and generating stations. Over eight milliard marks (£400,000,000 at par) is invested in German public supply undertakings, and though four-fifths of all German households and agricultural undertakings are served by public electricity supply, there is still scope for the employment of another 100,000 skilled men in the electrical industry, which is a key industry for many others; for example, the increasing industrial utilisation of electric heating has resulted in many improvements in products. Germany's electrical exports have been relatively well maintained during the depression, but it is considered that they are still capable of expansion. Electric refrigerators, for instance, should be used more freely in Germany, and efforts are to be made to increase their export.

Business and Industrial Notes

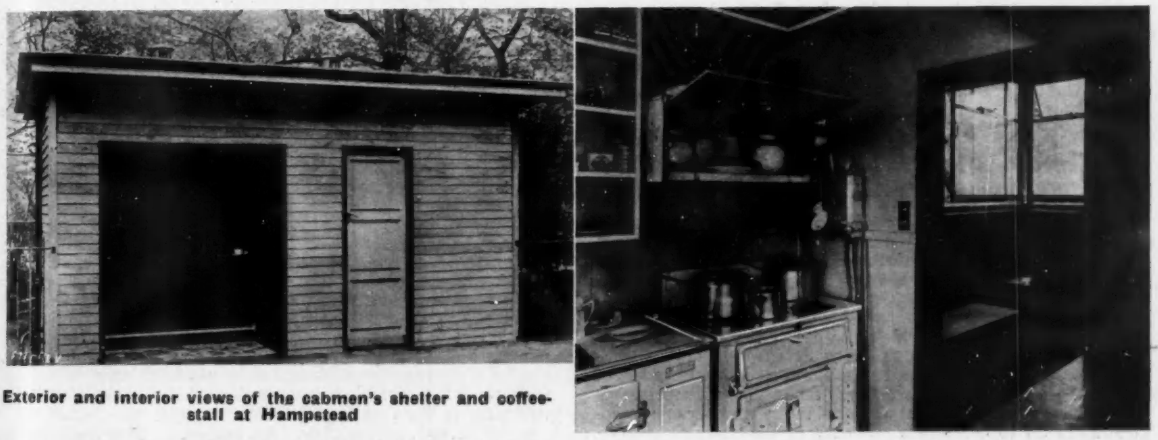
The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments. Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures

Employment in April

Employment in the engineering industry during April was moderate on the whole, with a slight improvement in electrical engineering. Statistics published in the *Ministry of Labour Gazette* show that the number of unemployed was 118,815, a decrease of 2,635 as compared with the previous month, the percentage falling from 12.6 to 12.3. In the electrical engineering section the number of unemployed was 6,587, as compared with 6,975, the percentage being 7.2 against 7.6 (9.7 per cent. in April, 1934). In the electric cable, apparatus and lamp manufacturing group there was a decrease from 14,805 to 13,347, the percentage falling from 11.1 to 10 (10.6 per cent. in April, 1934). There were also fewer unemployed in the electric wiring and contracting industry, the number being 4,885, as against 5,226, and the percentage 14.6, as compared with 15.7 in March (15.8 per cent. in April, 1934).

An All-electric Cabmen's Shelter

Where space is restricted, electricity nearly always scores heavily. At the coffee-stall of the new cabmen's shelter which has just been opened at Haverstock Hill, Hampstead, there is certainly no room to swing the proverbial cat, yet provision is made for cooking and storing a large variety of light meals. Cold food is kept in a capacious "Electrolux" refrigerator at the back of the stall, while a "Magnet" cooker deals with



Exterior and interior views of the cabmen's shelter and coffee-stall at Hampstead

all the hot dishes. To the left of the counter is a sink and draining board, hot water being supplied from a large G.E.C. water heater above. A 2-gal. heater provides the boiling water required for tea, coffee, &c., the pots of which incidentally are kept in a hot-cupboard over the cooker. Artificial lighting comes from three small lay-lights let into the ceiling over the counter.

Polish Visitors to the B.I.F.

On Monday last between thirty and forty members of the Polish Agents' Association visited the Engineering and Hardware Section of the British Industries Fair, and during the following two days took part in discussions in London at the Department of Overseas Trade, the Federation of British Industries and the London Chamber of Commerce. Individual members are visiting the more important provincial centres with a view to meeting manufacturers and exporters of various classes of goods, including cable and wire-drawing machinery, for which they desire to secure the representation of United Kingdom firms.

Wages in the Cable-making Industry

The Joint Industrial Council for the Electrical Cable-making Industry announces that there will be no "cost-of-living" alteration in wages on the third pay-day in June.

An American Marking Order

Under existing regulations all articles (with certain exceptions), together with their immediate container and the package in which they are imported into the United States, must bear an indication, in a conspicuous place, and in legible English words, of the country of origin. The Department of Overseas Trade states that, in view of recent experiences, it seems desirable to call exporters' attention to the following points. In the first place, nothing short of the name of the country of origin is accepted as a proper indication of origin. Thus, "Made in England" is acceptable, but not "English origin." The law further prescribes that the indication of origin, *i.e.*, marking, stamping, branding or labelling, shall be as nearly indelible and permanent as the nature of the article will permit, and decisions rendered regarding the application of this provision make it clear that labelling is not an acceptable alternative to other means of indicating the origin, if the nature of the article, its container or the package in which it is imported permits of a more permanent method of marking, such as stencilling. Again, if labelling is the only practicable means of indicating origin, and it is possible to sew on the label, attachment of the label by means of tags is not acceptable. The penalty for failure to mark imported articles strictly in accordance with the requirements is a fine of 10 per cent. *ad valorem* and, in addition, release from Customs is delayed until marking has been effectively carried out.

New French Company

A new company has been formed in Paris (60, Rue de Victoria) with a capital of one million fr. and the title La Société Continentale de Télévision to acquire and exploit in France and the French Colonies the patents of Baird Television, Ltd., London, and of Messrs. Robert Lyon and A. T. Stoyanowsky, Paris.

The Russian Industrial Programme for 1935

The total value of enterprises to come into operation in Russia during the current year is estimated at 22,466 million roubles, according to the *Bulletin* of the Russo-British Chamber of Commerce. Considerable developments are to take place in connection with electric power stations. The capacity of stations is to be increased by 750,000 kW, of which 10,000 kW is to be hydro-electric. A large extension is also to take place in the non-ferrous industry, as the capacity of aluminium works is to be increased by 80 per cent., while extensive developments are also projected in other branches. Developments to be carried out by various municipalities include an increase in tramway lines of 250 km., 600 new tramway carriages and fifty trolley buses. A number of large electric heating stations are proposed under the second Five-Year Plan, ranging from 40,000 to 250,000 kW. The construction has recently commenced of a new hydro-electric station at Perm, in the Urals, which is to have a capacity of 360,000 kW. A sum of 60 million roubles has been allotted for the purpose.

E.D.A. Sales Conference

Under the auspices of the E.D.A. Mid-East England Area Committee a sales conference was held in Leeds on May 15th. There were forty-five members of sales staffs present representing the supply authorities in the area. Mr. D. Bellamy, deputy commercial manager at Hull, delivered an address at the morning session on the design, staffing, and operation of showrooms in a large town, dealing in particular with the case of central showrooms, which was followed by a discussion. At the afternoon session, Mr. G. A. Proctor, sales manager at Manchester, spoke on the basis and methods of electricity supply advertising in a large town. At the close of the conference there was a unanimous request to the Area Committee to arrange a one-day sales conference in the autumn and spring of each year. Capt. A. W. Brown, the Mid-East Area Officer, presided.

Kelly's Directory

The forty-ninth edition of "Kelly's Directory of Merchants, Manufacturers and Shippers of the World" (Kelly's Directories, Ltd., 64s. post free), has now been published. This directory is produced in two volumes which cover the whole of the world. It is copiously indexed in English, French, German and Spanish, and very full instructions for its use are given in those languages. Vol. 1, which covers the whole world except Great Britain and the British Empire, is divided by continents. The divisions for each continent contain in

alphabetical order sections for the constituent countries. The section for each country contains in alphabetical order special sections for the towns, and the special section for each town is divided in its turn into trade headings alphabetically arranged. For the United States of America there is a general trades classification. The information in Vol. 2 deals with Great Britain and the British Empire. The section for Great Britain and Ireland is divided into three parts: England, Scotland and Wales (except London); London; and Ireland. Each part contains an alphabetical list of firms, a classification of the firms under trade headings, a list of telegraphic addresses and separate lists of the exporters and importers arranged alphabetically under the headings of the goods with which they deal. A coloured section contains reproductions of trade marks. The information concerning British Dominions, &c., is arranged in a similar way to the information appearing in Vol. 1. The regulations in force with regard to commercial travellers in all parts of the world and other useful information will be found at the beginning of Vol. 2.

Economy in Glue Heating

Particulars of the savings effected by a firm of printers in Leeds by converting twelve large glueing machines and pots to electric heating have been sent us by Messrs. Geo. Bray and Co., Ltd. The total loading of the elements is 25 kW; the consumption in twelve months has been 8,750 kWh, which at 0.8d. per kWh gives a total cost of less than £30 with electricity, as against £59 5s. with the methods previously employed. In addition there were considerable savings due to the elimination of boiling over, spoilage and uneven temperature of the glue. The pots and machines are fitted with thermostatically-controlled "Chromalox" strip or ring elements and are dry heated, no energy being used in heating water.

Batteries at Aldershot Tattoo

"Exide" and "Drydex" batteries are again being used this year in the Aldershot Tattoo for the illumination of the torches used by the troops taking part in the various evolutions. The batteries are supplied by Messrs. Burch & Vertue, Ltd., Aldershot.

Works Visits

On May 14th members of the Midland Section of the Electrical Power Engineers' Association visited the works of the Brush Electrical Engineering Co., Ltd., at Loughborough. The leaders of the party were Mr. R. H. Rawll, of the Birmingham Corporation, and Mr. H. F. Hudson, hon. secretary of the Midland Section, and the visitors included representatives from the Central Electricity Board, the West Midlands J.E.A., and from the electricity undertakings of Birmingham, Worcester, Walsall, Leicester, Derby, Nottingham, West Bromwich, Coventry and Wolverhampton Corporations. The party was conducted through every department of the company's organisation, and saw important orders in course of production. Particular interest was taken in the Transformer Department and the essential parts for a number of turbo-generators up to 30,000 kW capacity in the Turbine Department. The Rolling Stock Department was also found of interest. After the tour of the works, the visitors were entertained to tea at the King's Head Hotel, at which Mr. A. T. Brotherton, a director of the company, presided. Mr. Rawll thanked the company on behalf of the visitors for the opportunity of inspecting the works.

A party of eighty members of the Western section of the Electrical Contractors' Association recently paid a visit to the works of Edison Swan Cables, Ltd., Lydbrook, Forest of Dean. At luncheon in the Speech House Hotel, Mr. F. Gale (works manager) said that the Association had paved the way for the great advance in electrical development in this country, and its members formed the link between the supplier and the consumer. Referring to the site of the factory in one of the most rural parts of the country, Mr. Gale said that as far back as 1592 there was a record of a petition from the wireworkers of Tintern for the exclusion of foreign wire from the country. The party was conducted round the various process rooms and saw cable in every stage of manufacture.

About 110 members of the Birmingham Electric Club paid a visit recently to the Osram lamp and valve works at Hammersmith. Considerable interest was evinced in the various manufacturing processes connected with the making of lamps. In the afternoon visits were paid to the Osram factory at Wembley, including the glass works and the research laboratories, where demonstrations were witnessed of the various experimental work incidental to the development and manufacture of G.E.C. products.

Social Events

The Wallasey and Birkenhead Electrical Trades Golfing Society held its May meeting at the Caldy Golf Club on May 23rd, when the event took the form of a medal round. Competitors were divided into two sections—Class A, handicaps scratch to 18, and Class B, handicaps 19 and over. The captain's prize, presented by Mr. C. E Vines, was offered to the competitor returning the lowest net score. Two prizes were offered in each section.

The annual golf match of the Scottish Electrical Manufacturers' & Factors' Association was held at Glenbernie, Larbert, on May 15th, many representatives of the electrical trade taking part. The match included a stroke competition in the morning and a competition against bogey in the afternoon. Prizes were given by a number of well-known electrical companies.

The F.B.I. Business Forecast

The forecast published in the F.B.I. "Business Barometer" states that the culmination of the short-run international business cycle has brought in its train the usual crop of commodity and currency disturbances. Since we are no longer living in an "expanding world" but in a "contracting world" the situation is likely to grow more confused in coming months. The future of British trade as a whole will depend on the resistance which the group of sterling countries is able to offer to those adverse influences. The outlook for maintained activity in the home market is modestly encouraging; its level will be determined by building and public work.

Paris Radio Show

The Paris autumn radio exhibition will be held this year from September 5th to the 15th in the Grand Palais de l'Avenue des Champs Elysées.

Lloyd's Import Duties List

The sixteenth edition of "Lloyd's Import Duties List" published by the Corporation of Lloyd's, London, E.C.3 (1s. 6d.), contains a complete statement of the present position with regard to British import duties. A full index facilitates reference to the various commodities.

E.L.M.A. Illumination Design Course

The thirty-first E.L.M.A. Illumination Design Course was brought to a conclusion on May 16th with an informal dinner at the Howard Hotel, W.C. Mr. C. H. Cox (chairman of the E.L.M.A. Council), proposing the health of the guests, stated that 80 per cent. of the members of supply undertakings and contractors present had qualified for the certificate of full attendance at the course. This he regarded as particularly gratifying in view of the difficulties involved in holding the meetings in the temporary lecture theatre at Brettenham House. The reconstructed premises of the Lighting Service Bureau would, however, soon be available and would be better than ever before. Mr. J. W. Beauchamp (commercial mana-

Members of the Midland Section of the Electrical Power Engineers' Association at the works of the Brush Electrical Engineering Co., Ltd.

ger, C.E.B.), responding, referred to the first design course started by himself outside London over twenty-five years ago. Mr. Gellan (North Met. Co.) and Mr. L. J. Beard also responded.

Municipal Trading at Liverpool

At the last meeting of the Liverpool City Council a resolution was submitted with a view to restricting the sale of electrical goods and equipment "with the object of relieving the heavily rated shopkeepers and traders of Liverpool, who are engaged in this business from an undesirable form of competition." There was no discussion on the motion, which was formally referred to the Electric Power and Lighting Committee for consideration and report.

Finnish Marking Order

The Finnish Ministry of Commerce and Industry has recently issued an order requiring an indication of the country of origin on the following goods imported into Finland: Incandescent electric lamp bulbs measuring less than 50 mm. in cross-section and on bulbs of dull, coloured and frosted glass, either by grinding into the glass or by ineradicable printing on the metal base in 2 mm. letters. Origin must also be indicated on the packing in 3 mm. letters.

Trade Announcements

The Excel Electrical Equipment Co., Ltd., has removed to 5-11, Theobald's Road, W.C. (telephone: Chancery 8585).

Superlamp, Ltd., has opened a new branch at 82, Queen's Road, Watford (telephone: Watford 5383), which includes a showroom for the use of Watford and district traders.

Messrs. H. E. Kettle, Ltd., are removing during the Whitsun holidays to larger premises in Knightrider Street, Maidstone.

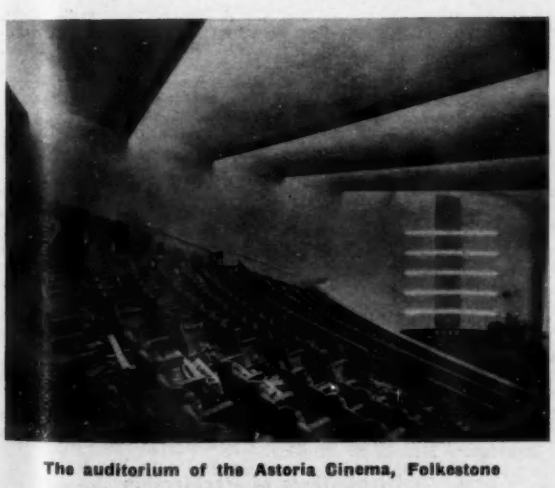
Ensign, Ltd., 38A, Queen Street, Belfast, has been appointed sole distributor for Northern Ireland for the products of British Electric Domestic Appliances, Ltd.

Orders Recently Booked

The new electricity offices at Nottingham are to be heated by electrical thermal storage, and the order for the heating installation has been placed with Messrs. Thos. Danks & Co., Ltd., of Nottingham. The 200-kW boiler and the control gear will be provided by Messrs. Bastian & Allen, Ltd.

A Cinema Lighting Installation

Full advantage of modern lighting technique has been taken in the designing of the recently opened Astoria Cinema at Folkestone. The floodlighting of the exterior has been carried out with Ediswan "Cygnus" projectors, each equipped with two "Royal Ediswan" 150-W lamps. The auditorium is lighted by a large number of concealed lamps in suitable cornices, with additional illumination derived from architectural lamps arranged in horizontal straight lines on the proscenium side walls. The illumination of the restaurant, stalls, foyer, and other parts of the building is mainly by means of special "Harcourt" chromium-plated ceiling fittings. Over 3,000 "Royal Ediswan" standard and architectural lamps are in use, and more than 30,000 yd. of Ediswan v.i.r. 600-meg. C.M.A. cable was used for the installation, which was carried out by Messrs. Drake & Gorham, Ltd. The consulting engineers were C. H. Bell & Co., Ltd., and the architect Mr. E. A. Stone.



The auditorium of the Astoria Cinema, Folkestone

New Australian Company

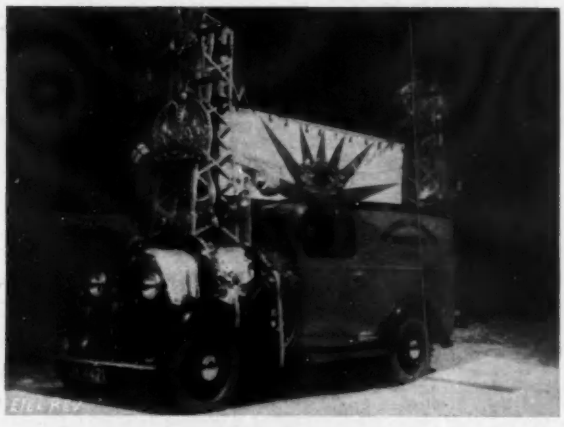
A company has recently been registered in Australia with the title Transmission Equipment Pty., Ltd., 12, Burnett Street, St. Kilda, Melbourne. It has been formed with a capital of £20,000 to manufacture, acquire and market complete radio, telephone, telegraph and broadcasting equipment and plant.

The Norwich Jubilee Procession

The Norwich Corporation Electricity Department was awarded the first prize in the recent Jubilee procession held in the city. Its entry consisted of a replica of the E.D.A. processional car for 1935. Owing to the clashing of dates, Mr. V. A. Pask, the borough electrical engineer, was unable to secure the E.D.A. car, so his staff constructed one of similar design.

The Eastbourne Celebrations

The accompanying illustration shows one of the vans of the Eastbourne Corporation Electricity Department in gala dress ready for the torchlight parade and decorated car procession which took place on Jubilee night. This procession, which paraded the sea front, included about 500 torch-bearers, and the light from their torches, coupled with the colour scheme of the electric lighting extending for one and a quarter miles along the promenades, lent an impressive touch to the Jubilee celebrations.



An Eastbourne Electricity Department van decorated for the Jubilee procession

Prices of Materials

The following prices are only general, and they may vary according to quantities and other circumstances.

CHEMICALS, ETC.	Price, May 22nd.	Fortnight's Inc. or Dec.
a Acid, Oxalic ... ... per cwt.	50s.	—
a Ammoniac, Sal ... ... per ton	£40	—
a Ammonia, Muriate (large crystal) ... „	£38	—
a Borax ... ... „	£17	—
a Copper, Sulphate ... ... „	£19 15s.	—
a Potash, Chlorate ... ... per lb.	3½d. to 4½d.	—
a „ Perchlorate ... ... „	6d.	—
a Shellac ... ... per cwt.	£4 18s.	—
a Sulphur Commercial... ... ... per ton	£11	—
a „ Roll ... ... „	£11	—
a Soda Chlorate ... ... per lb.	3½d. to 3¾d.	—
a „ Crystals ... ... per ton	£5 to £5 5s.	—
a Sodium Bichromate, casks ... ... per lb.	4d. nett.	—
METALS, ETC.		
b Aluminium, Ingots ... ... per ton	£100 to £105	—
b „ Wire ... ... per lb.	1/1 to 1/9	—
b „ Sheet and Foil... ... „	1/2 to 2/9	—
p Babbits Metal and Anti-friction Metals—		
Grade I ... ... per ton net	£209	£2 inc.
Grade II ... ... „	£143	£1 inc.
Grade III ... ... „	£73	—
c Brass (rolled metal 2" to 12" basis) per lb.	7¼d.	¼d. inc.
c „ Tubes (solid drawn ... ... „	9¼d. to 9¾d.	¼d. inc.
c „ Wire, basis ... ... „	7¼d.	¼d. inc.
c Copper Tubes (solid drawn) ... „	10d.	¼d. inc.
g „ Bars (best selected)... ... per ton	£64	£4 inc.
g „ Sheet... ... ... „		
g „ Rod ... ... „		
d „ (Electrolytic) Bars ... ... „	£38	£2 inc.
d „ „ Wire Rods ... ... „	£42	£1 10s. inc.
d „ „ H.C. Wire ... per lb.	6¼d.	¼d. inc.
f Ebonite Rod ... ... „	1/6 to 2/- plus	—
f „ Sheet ... ... „	1/3 to 1/6 10%	—
n German Silver Wire ... ... „	2/5	—
h Gutta-percha, fine ... ... „	nom.	—
h India-rubber, Para-fine ... ... „	4¼d.	¼d. inc.
i Iron, Pig, (Cleveland No. 3) ... per ton	62/6	—
i „ Wire galv. No. 1, P.O. Qual.... „	£20	—
g Lead, E glish Pig ... ... „	£16 15s.	£1 5s. inc.
g Mercury ... ... per bot.	£11/7/6 to £11/17/6	—
e Mica (in original cases) small ... per lb.	6d. to 1/-	—
e „ „ medium ... „	5/- to 10/-	—
e „ „ large ... „	10/6 to 17/6 up	—
p Phosphor Bronze, plain castings ... „	1/1	—
p „ „ drawn bars & rods „	11¼d.	¼d. inc.
p „ „ rolled strip & sheet „	10¾d.	¼d. inc.
p „ „ wire ... ... „	1/-	¼d. inc.
o Platinum ... ... per oz.	£7	—
d Silicum Bronze Wire... ... ... per lb.	7¾d.	—
r Steel, magnet, in bars ... ... „	7¼d.	—
g Tin, Block (English) ... ... per ton	£229	£4 inc.
n „ Wire, Nos. 1 to 16 ... ... per lb.	3/8	—

Quotations supplied by:—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta Percha and Telegraph Works Co., Ltd.
g Henry Gardner & Co., Ltd.
h Edward Till & Co.
i Bolling & Lowe.
n P. Ormiston & Sons.
o Johnson Matthey & Co.
p C. Clifford & Sons, Ltd.
r W. F. Dennis & Co.

The above table is published here fortnightly. In alternate issues, in which it does not appear, the latest prices of copper, silicium bronze wire, lead and rubber, up to the time of going to press, are given in our "Business Notes" under the same heading.

New Municipal Offices

On Monday last the Cardiff Corporation Electricity Committee approved the plans of the new headquarters of the Electricity Department. The proposed building is to be erected in the centre of the city on the site of the old Fish Market, The Hayes, which was purchased a few months ago from the Property and Markets Committee for £25,000. The outer shell and main external features of the Fish Market are to be retained, but an additional floor is to be provided, thus making room for the commercial staff on the first floor and allowing the second floor to be used exclusively by the technical staff. The facade of the present buildings is to undergo drastic alterations. The windows of the showroom on the ground floor are to be set back several feet forming a small arcade which is to be illuminated by means of concealed lighting. At the end of the arcade will be a small cinema theatre. This will seat about thirty persons, and in addition to a cinema screen, is to be equipped with a platform for demonstrations and lectures. The architect, Mr. Percy Thomas, is now engaged in preparing detailed plans, and as soon as these are ready tenders for the work will be invited.

For Sale

Ilkley U.D.C. has for sale a rotary convertor, generators, motor, &c.

Carlisle Electricity Department has for disposal surplus plant.

(See our classified advertisements.)

New Catalogues and Lists

W. Sisson & Co., Ltd., Gloucester.—A leaflet descriptive of marine steam main and auxiliary machinery.

Brush Electrical Engineering Co., Ltd., Loughborough.—A catalogue of motor convertors and a booklet entitled "Pioneers for 50 Years."

Medical Supply Association, Ltd., 167, Gray's Inn Road, W.C.1.—Particulars of a new infra-red ray generator and a few suggestions to doctors regarding apparatus which can be safely used in the home.

J. H. Sankey & Son, Ltd., The Hill, Ilford.—A booklet entitled "Lowering Heat Costs," which sets out the advantages of "Pyruma" plastic fire cement.

Handypick, Ltd., Sheffield.—Catalogues of spades, shovels, steels and the "Ideal" forging machine.

Amplec, Ltd., Broad Oak Mill, Church Street, Accrington.—A catalogue relating to electric wash-boilers.

A. Reyrolle & Co., Ltd., Hebburn-on-Tyne.—A booklet giving particulars of plugs and sockets.

W. R. White & Co., 22, Bruton Street, Berkeley Square, W.1.—A catalogue dealing with "Whiteway" lighting for pictures and tapestries.

Elliott Brothers (London), Ltd., Century Works, Lewisham, S.E.13.—A leaflet entitled "The Remote Indication or Recording of Water and Other Liquid Levels."

Edison Swan Electric Co., Ltd., 155, Charing Cross Road, W.C.2.—Booklets on floodlighting equipment and the "Jubilee" street-lighting lantern.

S. Wolf & Co., Ltd., 115, Southwark Street, S.E.1.—A leaflet giving brief details of a new light-duty ball-bearing drilling machine.

Sloan Electrical Co., Ltd., 8/12, Golden Lane, E.C.1.—New leaflets on fans and refrigerators.

L. Weekes (Luton), Ltd., Luton.—A complete sixty-page illustrated catalogue of switchgear and cartridge fuses.

Electrical Equipment & Carbon Co., Ltd., 107, New Oxford Street, W.C.1.—A booklet on overhead-line material.

Geo. Bray & Co., Ltd., Leeds.—A complete catalogue of "Chromalox" heating elements.

Sternol, Ltd., Royal London House, Finsbury Square, E.C.2.—A folder dealing with impregnating compound.

Bankruptcy Proceedings

R. C. V. Radeglia, electric lamp dealer, 40, King William Street, E.C.—The public examination of this debtor was held on May 21st before Mr. Registrar Mellor at the London Bankruptcy Court, the accounts showing total liabilities of £1,707 (ranking £1,454) and assets of £123. Replying to Mr. Cadwgan, Assistant Official Receiver, the debtor said that prior to 1922, when the company became dormant, he was director of a company which acted as selling agents for a Continental firm of electric lamp manufacturers. In that year he became director of Anti-Vibration Electric Lamp Co., Ltd., which was formed to continue the agency. He purchased £1,000 debentures and guaranteed the company's overdraft and other debts. In June, 1933, a receiver was appointed by the debenture holders, and, following the expiration of the agency agreements, proceedings were instituted against him under the guarantees, a settlement being effected in June, 1934, whereby he accepted personal responsibility for various matters. From 1925 from the company's offices, 13, Fish Street Hill, E.C., he also sold lamps, both as agent and on his own account on a commission basis. In April, 1934, he entered into an agreement for the sale of his agencies to his son for £240, payable by instalments, and he subsequently acted as agent for a firm of glass manufacturers. In November, 1934, judgment was obtained against him for £325 and costs in connection with the settlement of the previous June, and these bankruptcy proceedings ensued. The debtor attributed his insolvency to the guarantees given on behalf of the company and to his having lived beyond his income. Mr. W. B. Frampton appeared for creditors and Mr. Robert Fortune for the debtor, whose examination was concluded.

H. Etherington, Lawn Villa, Moorgate, and 104, Micklegate, both York, electrical and refrigerating engineer and contractor.—The public examination was held at the Law Courts, York, on May 16th. The statement of affairs showed gross liabilities of £3,700, with ranking liabilities of £1,250, and there were no assets. Debtor said he commenced business in 1910 at 69, Micklegate as an electrical engineer. About six years later he transferred the business to 104, Micklegate, and in 1927 added refrigerating work to his business. Last year his wife and two sons entered the business, and in October last a limited company was formed, with a nominal capital of £2,000. The shares were held by debtor's wife and sons. He attributed his failure to a judgment obtained against him. The examination was adjourned.

J. L. Gottlieb, wireless maker, 23, Ranulf Road, Hampstead.—The public examination of this debtor was held last week at the London Bankruptcy Court, the accounts showing total liabilities of £12,837 (ranking £7,037) and assets "bad book debt £2,281." Replying to the Official Receiver, the debtor said a previous failure was recorded against him in June, 1927, from which proceedings he was discharged in the following year. Since then he had been interested in succession in J. L. Gottlieb & Co., Ltd.; Aeonic Radio, Ltd.; Electrical & Radio Products, Ltd.; and Electrical & Radio Products (1931), Ltd. Whilst a director of the last-named company he gave various guarantees and accepted bills against goods supplied. Since May, 1934, he had acted as manager of another electrical company at a salary of £250 a year and had also, without remuneration, acted as secretary of a further company. The debtor attributed his insolvency to liabilities under guarantees given on behalf of one of the before mentioned companies. The examination was concluded.

J. C. De Wardt, trading as De Wardt Radio, 10, Windmill Street, Gravesend, radio and electrical engineer.—This debtor attended at the Court House, Eastgate, Rochester, on May 13th, for his public examination. He said his failure was attributable to losses through customers defaulting on hire-purchase agreements; effect of the television "scare" which prevented sales of ordinary sets; keen competition by large firms, and lack of capital. He stated that his liabilities amounted to £1,977, there were assets of £352, and a deficiency of £1,626. The examination was adjourned.

T. E. Crossley, 16, Ashfield Avenue, Morley, Yorks., electrical engineer.—The first meeting of creditors of the above was held on May 15th at the Official Receiver's office, 71, Manningham Lane, Bradford, when the statement of affairs showed ranking liabilities of £149, with net assets of £10, and a deficiency of £139. Debtor attributed his failure to keen competition, lack of practical business experience, and lack of capital. The case being a summary one was left in the hands of the Official Receiver, as trustee.

E. W. Hills, 9, Downs Road, Hastings, Sussex, and 20, Havelock Road, Hastings, radio dealer.—The public examination herein took place at the Town Hall, Hastings, on May 13th. Debtor attributed his failure to lack of capital, bad trade, and incautious buying. The examination was closed subject to the signing of the notes.

F. G. Harrison, wireless and electrical contractor, Ramper Charging Station, Saundby, Notts.—Receiving order made May 8th on debtor's own petition. First meeting May 24th at 1, St. Swithin's Square, Lincoln. Public examination June 13th at the Sessions House, Lincoln.

W. Marcroft and **J. Millington** (J. Millington & Co.), wireless manufacturers, 158, Derby Street, Bolton.—First and final dividend of 1s. 2d. in the £, payable May 28th at 31, Lloyd Street, Albert Square, Manchester.

S. A. Sears, radio engineer, "Romany," Redbourn, Herts.—Supplementary dividend of 5d. in the £, payable May 24th at 240, High Holborn, W.C.

W. M. Horsfall, electrical engineer, 7, Redcross Street, Liverpool.—Last day for receiving proofs for dividend June 1st. Trustee, Mr. J. Allcorn, Government Buildings, Victoria Street, Liverpool, Official Receiver.

H. Mortimer (Mortland Radio and Electric Co.), radio dealer, 4, Green Road, Leeds.—Last day for receiving proofs for dividend May 31st. Trustee, Mr. C. H. Baker, 3, Alfred Street, Boar Lane, Leeds.

A. Hunt, wireless dealer, 2A, Eldon Street North, Barnsley.—Receiving order made May 15th on debtor's own petition.

A. E. Poole and **H. Marsters** (Poole's), electrical engineers, 33, Union Street, Wednesbury.—Receiving order made May 11th on debtors' own petition.

Company Liquidations

Perry Radio Service, Ltd., 138, West End Lane, West Hampstead, N.W.6.—The statutory meeting of creditors herein was held on May 15th at the offices of Messrs. C. Latham & Co., 78, New Oxford Street, W.C.1, when a statement of affairs was submitted which disclosed liabilities of £252, all due to unsecured trade creditors. The net assets were £36, leaving a deficiency of £216. The creditors decided to confirm the voluntary liquidation of the company with Mr. Latham as liquidator.

Torquay Tramways Co., Ltd.—Particulars of claims by June 24th to Mr. E. A. Bond, 88, Kingsway, W.C., joint liquidator.

Litholite Insulators, Ltd.—Meeting June 17th at Sandown Road, Watford, to receive an account of the winding-up by the liquidator, Mr. H. A. Judge.

Falcon Batteries, Ltd.—Meetings June 18th at 35, Windsor Place, Cardiff, to receive an account of the winding-up by the liquidator, Mr. L. S. Findlay.

Dissolutions of Partnership

Turner & Whitley, electrical engineers and contractors, 64a, Church Street, Tunstall, Stoke-on-Trent.—Messrs. W. L. Turner and T. L. Whitley have dissolved partnership. Mr. Whitley will attend to debts and carry on the business under his own name.

Metropolitan Radio Service Co., manufacturers of and dealers in wireless goods, 1021, Finchley Road, Golders Green, N.W.—Messrs. M. Deitch and A. Rockberg have dissolved partnership. Mr. Deitch will attend to debts and carry on the business.

Ames & Willmer, electrical engineers, Chichester.—Messrs. F. W. Ames and R. C. Willmer have dissolved partnership. Mr. Willmer will attend to debts and carry on the business under his own name.

Neo-Motive Displays, neon sign specialists, 72, Navigation Street, Birmingham.—Messrs. S. G. Gardner, R. Gillies, and G. S. Gillies have dissolved partnership so far as concerns Mr. Gardner, who retires from the firm.

Electricity Supply

Lighting, Domestic, Power

Bedford.—EXTENSIONS TO HOUSES.—To provide supplies to seventy houses at Kempston the Electricity Committee is to extend mains at a cost of £550.

Bideford.—UNDER-WATER CABLE.—A cable has been laid across the River Taw by the Bideford & District Electric Supply Co., Ltd., to supply the villages of Braunton and Saunton.

Bishop Auckland.—HOSPITAL LIGHTING.—The Auckland, Shildon and Willington Joint Hospital Board has decided to install electric lighting in the hospital buildings in Tindale Crescent.

Boldon (Co. Durham).—STREET LIGHTING.—The Parish Council has obtained sanction to borrow £580 for electric street lighting.

Breamore (Wilts).—A JUBILEE GIFT.—An artistic electric lamp standard has been presented to the Breamore Parish Council as a Jubilee commemoration gift from Lady Hulse. The standard was supplied by Messrs. Falk, Stadelmann & Co., Ltd., and the lantern by the Revo Electric Co., Ltd. The concrete work and installation were carried out by the Ringwood Electric Supply Co. under the supervision of Mr. P. J. Wildsmith, district engineer.

The Jubilee standard at Breamore

Brighton.—SWIMMING BATH FLOODLIGHTING.—A system of floodlighting is to be installed at the Rottingdean swimming pool during the summer.

SUB-STATION.—The Electricity Committee is to provide a sub-station for the Bevendean area at a cost of £3,059.

Bulgaria.—ELECTRICAL DEVELOPMENT.—Legislation has recently been enacted to encourage the electrification of the country. Already considerable progress has been made, the number of power plants in operation having increased from 2 in 1912 to 21 in 1918; 47 in 1930; and 55 at the present time. According to the latest figures, the annual output amounted to approximately 116 million kWh, 30 million kWh being generated by municipally owned stations and the remainder by private plants. There has been also a considerable increase in the number of distribution lines, namely, from 20 in 1924 to 200 in 1934. The Government is considering the question of electrifying the most important State railways, including the line from the Jugoslav frontier to the Turkish frontier through Sofia and the railway leading to the Pernik coal mines. It also contemplates taking steps to secure the improvement of the electric transport systems of Sofia, Varna and Burgas.

Burton Latimer.—H.V. CABLE.—The Urban District Council has consented to Kettering Electricity Department's proposal to lay an h.v. cable from Polewell Lane to the Isham boundary.

Caistor.—COUNCIL HOUSES AND ELECTRICITY.—The Housing Committee has decided not to wire its houses for electricity, but has granted the tenants permission to have the work carried out themselves if they so desire.

Carlisle.—MAINS EXTENSIONS.—The Electricity Committee is to extend mains at a cost of £1,745.

Ceylon.—ADDITIONAL PLANT.—Following a report by Messrs. Preece, Cardew & Rider, consulting engineers, that an extension of the Stanley power station, Kolonnawar, is urgently needed, work has been put in hand on the installation of an additional 3,000-kW generating set.

VILLAGE ELECTRIFICATION.—Major C. H. Brazel, Chief of the Government Electricity Department, in a recent report, foreshadowed the creation in Ceylon of a network of transmission lines similar to the grid system in Great Britain.

Chesterfield.—ELECTRICITY FOR PUMPING.—The Electricity Committee is to supply electricity for water pumping purposes to Messrs. Robinson & Sons, Ltd., for a period of ten years at ½d. per kWh, excepting a period between mid-October to mid-March in each year.

Dartford.—MAINS EXTENSIONS.—The Electricity Committee is to extend feeder and distributor mains at a cost of £2,190.

Dunmow.—OBJECTION TO OVERHEAD LINES.—The Rural District Council has objected to the erection of overhead lines at Little Hallingbury by the County of London Electric Supply Co. on the ground that the amenities will be spoiled. It has requested the Essex County Council to take a similar course.

Eastbourne.—GRAND PARADE IMPROVEMENT.—Rapid progress is being made on an extensive improvement scheme at Grand Parade, and a contract has been entered into for electrical installations at the new bandstand, promenades and shelters. This work is being carried out to a specification prepared by the Electricity Department, and is estimated to cost about £3,000. Approximately 1,500 lamps will be used, and the existing Grand Parade sub-station is to be reconstructed and enlarged at an estimated cost of £385.

JUBILEE ILLUMINATIONS.—So successful did the illuminations prove that efforts are being made to secure their retention for the remainder of the season, and already some of the hotels are taking advantage of the reduced tariff so that they can continue their special lighting.

EXTENSIONS.—The Electricity Committee has sanctioned extensions to the Lawns estate (£322); Ersham Lodge estate, comprising about 120 houses (£4,084); and Jenkins Green (£130).

FRINGE ORDER.—The Corporation is to apply for a Fringe Order to supply two districts (Carters Corner and Highlands Farm) adjoining the existing supply boundary.

OVERHEAD LINES.—The Minister of Transport has sanctioned the erection of overhead-line extensions to Birling Gap and Priesthawes.

France.—HYDRO-ELECTRIC SCHEME.—A new hydro-electric power station has recently been completed on the River Moselle by the Metz Electricity Department. The plant, which works under an unusually low head ranging from 49 to 124 ft., comprises three 1,360 kVA Kaplan vertical-shaft turbines direct-coupled to alternators generating power at 5,500 V at 75 r.p.m. The power is stepped up to 17,500 V for transmission to the Metz district.

Godstone.—BULK SUPPLY.—The Sevenoaks & District Electricity Co., Ltd., has arranged to take a bulk supply of electrical energy from the grid at East Grinstead, and the Godstone Rural District Council has consented to the erection of the necessary overhead transmission lines.

Great Aycliffe (Co. Durham).—STREET LIGHTING.—A loan of £250 has been sanctioned for electric street lighting.

Helpringham.—PROMISE OF A SUPPLY.—The Mid-Lincolnshire Electric Supply Co., Ltd., is to provide a supply of electricity to the village by the end of the summer. The price will be 7d. per kWh.

Ornamental flower gardens on the sea front at Brighton illuminated by revolving lights similar to spotlights for the Jubilee celebrations

Hopeman.—STREET LIGHTING.—The Moray County Council has approved a proposal to have the streets lighted by electricity.

Hoylake.—NEW TYPE OF STREET LIGHTING.—A new type of street lighting designed by Mr. E. Jones is being tested by the Urban District Council in Queen's Road.

Huntly.—ELECTRIC LIGHTING.—The Grampian Electricity Supply Co. is to submit proposals regarding the lighting of the town by electricity.

India.—PALLIVASAL POWER SCHEME STARTED.—The Maharajah of Travancore recently laid the corner-stone of the power house for the hydro-electric project at Pallivasal. Work on the scheme is well in hand and is expected to be completed within the scheduled time so that supply begins towards the end of 1936.

Liverpool.—EXTENSION OF AREA.—The Electricity Commissioners have submitted to the Minister of Transport a Special Order authorising the Liverpool Corporation to extend its area of supply to include Altcar, Downholland, Melling and Simonswood.

A LARGE LOAN.—The City Council has decided to apply for powers to borrow £300,000 for the provision of mains.

London.—ISLINGTON.—The Electricity Committee is to extend mains to supply twenty-three tenants in Fowler Road under the rental wiring scheme.

FULHAM.—The Electricity Committee is to improve street lighting at a cost of £2,300.

HACKNEY.—At a cost of £1,333 flats at Bannister Street are to be provided with a supply of electricity for power purposes.

HAMMERSMITH.—Some time ago the Electricity Committee gave instructions for counsel's opinion to be taken upon the contention of the Inland Revenue authorities that, in addition to tax on gross profits, tax is payable by the Council also on the amount recovered for loan charges under the agreement between the Council and the London and Home Counties J.E.A. for the supply of electricity in bulk. The opinion of Mr. A. M. Latter, K.C., was duly obtained, and he advised that the Inland Revenue authorities were correct in assessing income tax on the loan charges in question, at any rate so long as electricity was generated at the Council's generating station. The town clerk has, therefore, been authorised to withdraw the appeals against the income tax assessment, and payment is to be made of the tax for the years 1930/31 (£2,044) and 1931/32 (£9,625).

Manchester.—PROGRESS DURING MARCH.—There were 1,936 new consumers connected during March and 1,020 requests were received for additional supplies, the total increased load amounting to 5,961 kW. Orders received for hired appliances were as follows, the total number on circuit at the end of the month being given in parentheses: Cookers, 314 (14,539); wash-boilers, 28 (785); and water-heaters, 69 (948). The output to the Manchester system during the month increased by 2.8 per cent. over 1934 to 51,167,000 kWh.

Newcastle-upon-Tyne. — CHANGE-OVER COMPLETED. — The North-Eastern Electric Supply Co., Ltd., has completed its scheme for the change-over from d.c. to a.c. in Newcastle-upon-Tyne. The work was started in 1931 and was not expected to be finished before the end of this year.

Northern Ireland.—ELECTRIC SUPPLY BILL.—The terms of the Northern Ireland (Electricity Supply) Bill were read in the Northern Commons last week for the first time. Provision is made for an increase from £1,000,000 to £2,000,000 in the sum which may be borrowed by the Electricity Board. The Bill further removes all doubt about the expression "electric line" by declaring that it includes and always has included poles, stays, and other supports used to carry an electric line.

Norwich.—STREET LIGHTING IMPROVEMENT.—The Electricity Committee has prepared a scheme for the improvement of street lighting at a cost of £23,531.

Portland.—DOCKYARD SUPPLY.—H.M. Naval Depôt is to be offered a bulk supply for dockyard purposes at £4 per kW of maximum demand per annum, plus 0.4d. per kWh, the supply being given at 11,000 V.

Portsmouth.—MAINS EXTENSIONS.—Permission has been obtained by the Electricity Committee to extend mains to Binderton, West Sussex, and Hundred Acres, Hants.

Rushden.—LOAN FOR LIGHTING.—Sanction has been received to the raising of a loan of £783 for central lighting along the main road.

South Africa.—VENTERSBURG SUPPLY.—The Administrator of the Orange Free State has stated that he is prepared to consider an electricity supply scheme for Ventersburg, provided he is satisfied that the local water supply has been adequately provided for, and that the sanitation is brought into line with modern requirements.

Stockton-on-Tees.—ELECTRICALLY EQUIPPED HOUSES.—Electricity is to be installed in 304 houses on the Blue Hall estate at a cost of £1,820.

LOAN.—The Town Council is applying to the Electricity Commissioners for sanction to borrow £10,000 for mains and services, &c.

Sunderland. — SUB-STATION. — The North-Eastern Electric Supply Co., Ltd., is to erect a sub-station on the St. Aidans' estate, Sunderland.

Switzerland. — POWER TRANSMISSION OVER MOUNT ST. GOTHARD.—In a recent issue of *L'Elettrotechnica*, particulars were given of the 150,000-V power transmission line which has lately been completed over the St. Gothard mountain between Lavorgo and Amsteg, a distance of about 35 miles, to connect the power distribution systems of Northern and Southern Switzerland. The line, parts of which are at an altitude of over 7,000 ft. above the sea, is supported on 168 hot-galvanised steel towers, the average span being 404 yd. The towers have been so constructed that they can be increased in height to support a second transmission line.

Wakefield.—COUNCIL HOUSE EQUIPMENT.—The Housing Committee has agreed to provide an electric copper, radiator, and four plug points in houses being erected at Horbury Road.

SUB-STATION.—A sub-station is to be erected on the Peacock Farm estate at a cost of £450.

West Stirling.—ELECTRICITY FOR KIPPEN AND BUCHLYVIE.—The Grampian Electricity Supply Co., Ltd., has notified the Electricity Commissioners that it is likely that a supply of electricity at Kippen and Buchlyvie will be ready soon after the end of July.

Whitby.—SUPPLY TO HAWSKER.—The Urban District Council is to borrow £468 in connection with its scheme for extending electricity to Hawsker. The Ministry of Transport has approved the erection of overhead lines.

Whitchurch.—STREET LIGHTING.—Electricity is to replace gas for the street lighting, the Council having accepted the tender of the North Wales Power Co. for a ten year contract.

Wolverhampton.—SUPPLY IMPROVEMENT.—The Electricity Committee is to improve the supply in the Park and Dunstall wards at a cost of £3,111.

Government Contracts

THE following contracts were placed by various Government Departments during April:—

ADMIRALTY.

W.t. boards.—Whipp & Bourne.
Electric cable.—Pirelli-General Cable Works.
Condensers.—Dubilier Condenser Co. (1925).
Electric lighting installation.—G. E. Taylor & Co.
Electric fans.—Allen, Sons & Co.; Veritys.
Motor generators.—Haslam & Newton; W. Mackie & Co.; Allen, Sons, & Co.
Keys, &c.—G.E.C.; Ross Courtney & Co.; H. W. Sullivan; Walters Elecl. Mfg. Co.; Whipp & Bourne.
Electric lamps.—G.E.C.
Main battery.—D.P. Battery Co.
Starters, &c.—E. N. Bray; Elecl. Apparatus Co.; Watford Elecl. & Mfg. Co.
Switches, &c.—Engg. & Lighting Equipment Co.
Thermo ammeters.—Elliott Bros.; Everett, Edgcumbe & Co.; E. Turner Elecl. Instruments.
Transformers.—Foster Engg. Co.; Johnson & Phillips.
W.t. valves.—Ediswan; G.E.C.; Mullard Radio Valve Co.
Wireless receiving accessories.—Gambrell Bros.; G.E.C.; Marconi's; Plessey Co.; R.I., Ltd.; H. W. Sullivan.
Wireless receiving models.—A. Graham & Co.; Marconi's; R.I., Ltd.; H. W. Sullivan.
Wireless transmitters, &c.—Gambrell Bros.; R.I., Ltd.; H. W. Sullivan.

WAR OFFICE.

Electric cable.—Henley's.
Generating sets.—Ruston & Hornsby.
Electric lamps.—B.T.H.; Stella Lamp Co.; G.E.C.; Cryselco, Ltd.; Siemens Elec. Lamps & Supplies; Ediswan.
Switchboards.—Ferguson Pailin.

AIR MINISTRY.

Dynamotors and spares.—Haslam & Newton.
Electrical accessories.—G.E.C.
Engine spares.—B.T.H.; Rotax, Ltd.
W.t. valves.—Plessey Co.

POST OFFICE.

Telephonic apparatus.—Ericsson Telephones; G.E.C.; Huntley, Bourne & Stevens; Plessey Co.
Testing and protective apparatus.—Blick Time Recorders; Elect. Construction Co.; Hewittic Electric Co.; Partridge & Mee; Phœnix Telephone & Elect. Works.
Battery stores.—Siemens Bros.
Cable.—G.E.C.; Siemens Bros.; Standard Telephones; Telegraph Construction & Maintenance Co.
Secondary cells and parts.—Britannia Batteries; D.P. Battery Co.
Electric clocks.—Gillett & Johnston.
Loading coils and rectifying valves.—G.E.C.
Telephone cords.—London Elec. Wire Co. & Smiths; L.P.S. Elecl. Co.; Phœnix Telephone & Elect. Works; Reliance Elecl. Wire Co.; Standard Telephones.
Electric lamps.—B.T.H.; Crompton Parkinson; Cryselco, Ltd.; Ediswan; G.E.C.; Siemens Elec. Lamps & Supplies; Stella Lamp Co.
Armoured cable underground work.—Bristol-Sharpness.—G. F. Leadbeter. London-Liverpool (Oxford-Kidderminster section). —Standard Telephones. Bristol-Newport.—W. Connolly & Co.
Cabling and loading coils.—York-Scarborough; Macclesfield-Stockport; Dundee-Forfar; Manchester-Atherton-Leigh; Stockton-West Hartlepool; Derby-Burton-on-Trent; Northampton-Kettering.—United Telephone Cables. Sub-contractors: Automatic Elect. Co. for loading coils. Nottingham-Mansfield.—Standard Telephones.
Electric lifts.—Belfast.—Evans Lifts. London (conversion of two a.c. lifts to d.c.).—W. Wadsworth & Sons.
Telephone exchange equipment.—Portsmouth; Bristol; Crossgates (Leeds); Hillside (London); Manchester.—Automatic Elect. Co. Thornton Heath (London); Canterbury; East (Manchester); Market Harborough; Derby; Swindon.—Ericsson Telephones. Sub-contractors for Swindon: Pritchett & Gold & E.P.S. Co. for batteries; Electric Construction Co. for motor-generators. Bridgnorth (Wolverhampton); East (Birmingham); Ponders End (London).—G.E.C. Sub-contractors for Ponders End: D.P. Battery Co. for batteries; W. Jones & Co. for ringing machines. Sutton Coldfield (Birmingham); Brighton; Shirley (Birmingham); Cardiff; Chichester; Lisburn (Belfast); Lancing; Arbroath; Chesterfield; Londonderry; Tideway (London).—Siemens Bros. Sub-contractors for Londonderry and Tideway: Hart Accumulator Co. for batteries; Electric Construction Co. for motor-generators and ringing machines. International telephone and trunk exchanges (London); Newcastle West; Gerrard's Cross.—Standard Telephones. Sub-contractors for Gerrard's Cross: Hart Accumulator Co. for batteries; Electric Construction Co. for motor-generators.
Telephonic repeater equipment.—Liverpool.—Standard Telephones.
Voice-frequency telegraph equipment.—Sheffield; Leeds.—Standard Telephones.

H.M. OFFICE OF WORKS.

Electric wiring.—Bush House (London).—A. Watson & Dundas.

CROWN AGENTS FOR THE COLONIES.

P.B. poles.—Callender's Cable & Constn. Co.
Static condensers.—Telegraph Condenser Co.
Telephone cable.—B.I. Cables; Henley's.

Traction

Australia.—SYDNEY TRAMWAYS.—Mr. Bruxner, the Minister of Transport of New South Wales, stated recently that steps are being taken to make the Sydney tramways self-contained. This involves the taking over by the Transport Commission of a number of suburban electric power stations at present controlled by the Railway Department. The Government, according to Mr. Bruxner, does not propose to substitute trolley-buses for the tramways on the Castlereagh Street and Pitt Street routes.

MELBOURNE CABLE TRAMWAY CONVERSIONS.—The Melbourne and Metropolitan Tramways Board has now authorised the conversion to electric working of the cable tramways to Brunswick and North Melbourne. The first is estimated to cost £380,000 and the second £112,000. Tenders are to be invited for the carrying out of the work, and additional tramcars are to be constructed at the Board's workshops.

Austria.—FIVE-YEAR PROGRAMME.—The Government intends to raise a sum of 150,000,000 schillings (about £6,000,000 at the present rate of exchange), much of which is to be devoted to railway electrification. It has been decided to proceed with the conversion of the 196-mile main line from Vienna to Salzburg, and this is to be completed by 1940 at a total cost of 180,000,000 schillings (about £7,200,000).

Egypt.—RAILWAY ELECTRIFICATION PROPOSALS.—In his report on the Egyptian State Railways Sir Felix Pole expresses the opinion that the introduction of light units on branch lines in accordance with modern practice should be given a trial before a final decision is taken on the subject of electrification. He recommends that the electrification of the Cairo to Helwan line should be authorised immediately, as full plans have already been prepared, and that work on the Cairo to Mataria line should follow—either on the "cut and cover" or tube principle.

Great Britain.—LONDON TRANSPORT BILL.—Consideration of the petitions by property owners against the London Transport Bill was completed last week by the Select Committee of the House of Commons. Mr. Craig Henderson, on behalf of the Board, offered an undertaking so far as the "fly-over" at Kensington was concerned, that the lines should not be raised more than 8 ft., that they should be kept 60 ft. from Douglas Mansions, and that the most up-to-date method of noise absorption would be employed. This undertaking was accepted by the petitioners.

TRAFFIC SIGNALS.—It is reported in *The Times* that a scheme for the provision of automatic light signals on a much larger scale than heretofore is being considered by the Ministry of Transport, Scotland Yard and local authorities in the Metropolitan Police area. Schemes in London have so far been piecemeal in character, and Lord Trenchard, the Commissioner of Police of the Metropolis, recently stated that the progress made had not been nearly so rapid as he could have wished. By the proposed new method long stretches of roadway could be dealt with. The Commissioner of Police has expressed the view that there are more than 400 intersections in the London district at which automatic traffic control equipment could be installed, and it is calculated that the resultant saving would be about £60,000 a year.

The borough engineer of Holborn switching on the new "Autoflex" (Siemens and General Electric) traffic signals in New Oxford Street.

MINISTER FAVOURS TROLLEY-VEHICLES.—The Minister of Transport (Mr. Hore-Belisha) stated in the House of Commons last week that he was satisfied that the substitution of more mobile units, including trolley vehicles, which did not require the presence of rails in the road bed, made for safety, and that he would do all he could to encourage the process.

EAST HAM TRAMWAYS.—A dispute arising out of the transfer to London Transport of the East Ham Corporation tramways undertaking in 1933 was before the London Passenger Transport Arbitration Tribunal on Monday. The point at issue was in respect of a special reserve fund of £3,740 established by the Corporation which the Board contended to be part of the assets of the transferred undertaking on the appointed day. On behalf of the Corporation it was stated that the reserve was established for the purpose of meeting third-party insurance risks. The Tribunal reserved its decision.

RAILWAY SIGNALS FOR FOGGY WEATHER.—Experiments are being carried out by the L.M.S. Railway Co. at Upton Park with a new type of electric light signal for use in foggy weather.

WALTHAMSTOW TRAMWAYS.—The London Passenger Transport Arbitration Tribunal has approved the transfer of the Walthamstow Corporation tramways to the London Transport Board.

Hastings.—TROLLEY-BUSES AND RADIO INTERFERENCE.—The Transport Committee has been instructed to ascertain what steps can be taken to prevent interference by trolley-buses with radio reception.

India.—PROPOSED RAILWAY ELECTRIFICATION.—The South Indian Railway authorities are considering a proposal to extend the electric system a distance of nineteen miles to Chinglepet. It is believed that the eventual extension of the electrified system to Akonam to cope with the Conjeeveram traffic is contemplated.

Irish Free State.—DUBLIN STRIKE OVER.—A message from Dublin states that the transport employés and the United Tramways Co. have accepted the terms of settlement put forward by the Minister of Industry and Commerce. The strike has lasted twelve weeks.

Italy.—ELECTRIC LOCOMOTIVE DESIGN.—In a recent issue of the *Rivista Tecnica delle Ferrovie Italiane* Signor Giuseppe Bianchi gives details of the advantages which have been derived in Italy in consequence of the standardisation of electric locomotive design. Tests showed that per 1,000 hours running the number of hours spent on repairs was 6.19, 1.07, 0.6 and 0.32 in the case of four different non-standard locomotives, while with a standard design the figure was only 0.176 hr. In the case of the non-standard engines the average number of breakdowns was 8.4 and with the standard type 1.76 per 100,000 miles.

South Africa.—BLOEMFONTEIN TRAMWAYS.—The report of Mr. E. M. de Beer, who recently conducted an official inquiry into the complaints and suggestions made by the Bloemfontein Transport Workers' Union in a memorandum which that body submitted last year to the Town Council, has now been issued. The report indicates that tramcars are more suitable than buses for regular services, and supports the tramway employés in their contention that trams cost much less than buses to maintain. On the assumption that each type of vehicle covers 40,000 miles a year, Mr. de Beer finds that the life of a tram is fifteen years and that of a bus six years.

Warrington.—TRAMWAY TO BE DISCONTINUED.—The last remaining tramway route in Warrington is shortly to be taken over by buses.

Communications

Australia.—TELEPHONE AND WIRELESS PROFITS.—A very satisfactory state of affairs is revealed in the annual report of the Postmaster-General's Department for 1933-34, particularly with regard to the telephone branch, which showed a surplus of £269,273, as compared with a deficit of £200,275 in the preceding year. Earnings from telephones increased by 4.3 per cent., and expenditure was 4.08 per cent. less. In the wireless branch there was a surplus of £87,235 (£22,796 in 1932-33), the earnings increasing by 40.09 per cent. and expenditure by 7.54 per cent. The deficit of £41,012 on the telegraph business was £60,576 less than in 1932-33, earnings being up by 4.39 per cent. and expenditure down by 0.69 per cent.

Bulgaria.—NEW WIRELESS STATION.—The German Telefunken Co. has been given an order by the Bulgarian Government for the erection of a new broadcasting station. According to *Reuter* (Berlin), the new station will be erected at Vakazal, near Sofia, and will be ready for service early next year.

Great Britain.—ULTRA-SHORT-WAVE RADIO.—Test transmissions on five metres were recently carried out from the roof of the *Daily Telegraph* building by the International Short-Wave Club. Conditions were unfavourable for the attempt to break the distant-reception record on this wavelength, and the effort to make contact with Birmingham was unsuccessful. Many amateurs in London and outlying suburbs in most directions up to a radius of fifteen miles reported excellent reception. The transmitter was made by amateurs at a cost of 30s., and a power of only 10 W was used.

A decision to form a research and experimental section of active amateur transmitters with the object of ascertaining the possibilities of micro-waves was made by over fifty members of the Radio Society of Great Britain at a meeting of the South-Western Provincial Group at Torquay. Mr. J. Clarricoats, the London secretary, said he considered the south-western district ideal for transmission and reception on very short wavelengths.

South Africa.—DEVELOPMENT SCHEMES.—The estimates of expenditure to be defrayed from loan funds in the Union during the year ending March 31st, 1936, include a sum of £465,000 for the development of existing telegraph, telephone and wireless systems, and £234,000 for special new services, including £63,000 for the extension of farm lines, £25,000 for rural telephone extensions and £23,000 for a wireless station at Roberts Heights, Pretoria.

Contract Information

When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below

Contracts Open

Aberdeen.—June 17th. Electricity Department. Two water-tube boilers. (See this issue.)

Ayr.—May 27th. County Council. Electrical and central heating work at new school at New Cumnock. W. Reid, County architect, County Buildings.

Bedford.—May 30th. Electricity Department. Electric water heaters, cooker control units, meter boards, cable covers and cut-outs for the year ending September 30th, 1936. (May 17th.)

Boxhill.—May 30th. Electricity Department. Outdoor type ironclad ring main 11-kV switchgear. (See this issue.)

Birmingham.—May 31st. Electric Supply Department. Motor convertors. (May 10th.)

June 14th. E.h.p. and l.p. cables. (May 17th.)

Brentford & Chiswick.—June 12th. Electricity Department. E.h.p. and l.p. cables, l.p. feeder pillars, e.h.p. kiosks, transformers and switchgear. (See this issue.)

Brighton.—May 27th. Corporation. Two 11,000-kVA and two 6,000-kVA transformers. (May 17th.)

Bristol.—June 14th. Airport Committee. Shadow-bar floodlight, illuminated wind indicator, cable connections and wiring and control switches for the airport. (See this issue.)

Buckingham.—May 31st. Corporation. Two electrically driven well pumps. Chatterton & Alford, 11, Victoria Street, S.W.1.

Chartham (near Canterbury).—June 11th. Kent County Mental Hospital. Electric wiring of sixty-four cottages and farm bailiff's house. (See this issue.)

Chile.—SANTIAGO.—June 24th. Ministry of National Defence. Electric travelling portal cranes for the Port of Iquique. (A.Y. 13067.)*

Colchester.—June 1st. Education Committee. Electrical installation at Old Heath Council school. Education Office, 3, Trinity Street (deposit £1).

Dagenham.—May 31st. Engineer and Surveyor's Department. Electrical installations in 167 houses. (May 17th.)

Eccles.—May 27th. Town Council. Twelve months' supply of single-phase a.c. house-service integrating meters. Borough electrical engineer, Electricity Offices, King Street.

Egypt.—CAIRO.—July 18th. Ministry of the Interior. Substation equipment, transmission lines, telephone lines, cables, distribution pillars, transformers, &c. (A.Y. 13059.)*

Exeter.—May 30th. Electricity Department. Meters. (May 10th.)

Grimsby.—June 5th. Electricity Department. 11-kV switchgear. (See this issue.)

Hawarden.—May 29th. R.D.C. 8,000 yds. of 11-kV overhead line, 2,250 yds. of 11-kV insulated cables, 3,000 yds. of l.p. overhead line, 150 yds. of l.p. insulated cable, two pole transformer sub-stations, and three 11-kV pole mounted switches. (May 10th.)

June 12th. Prepayment and ordinary type meters. (See this issue.)

May 29th. Electricity Department. Two 11-kV circuit-breakers. (See this issue.)

Heston and Isleworth.—June 6th. Electricity Department. Cable, transformer and switchgear. (See this issue.)

Irish Free State.—CASTLEBAR.—May 27th. Mental Hospital Committee. Electrical installation at the mental hospital. P. J. Munden, architect, 1, South Frederick Street, Dublin (deposit £15 15s.).

DROGHEDA.—May 28th. Electric wiring and equipment at the new technical school. Delap & Waller, 16, Molesworth Street, Dublin (deposit £5 5s.).

MALLOW.—June 22nd. North Cork Board of Health and Public Assistance. Electric lighting and power services in the new County Hospital. D. C. Murphy, Secretary's Office, County Hospital (deposit £20).

Jedburgh.—Town Council. Various works, including electrical, at eighty houses. Wilson & Tait, architects, Grangemouth (deposit £1 1s.).

Lincoln.—June 7th. Electricity Department. One 13-panel 250,000-kVA control board. (May 17th.)

Liverpool.—May 29th. Electric Supply Department. H.p. and l.p. switchgear for sub-stations for two years. (May 10th.)

Lowestoft.—May 27th. Electricity Department. One 1,500-kVA transformer. (May 17th.)

Manchester.—Electricity Committee. May 25th. 420-V three-phase a.c. house-service switchgear. (May 10th.)

May 29th. Weldless steel lamp columns and fittings. (May 17th.)

June 3rd. Batteries and charging gear. (See this issue.)

May 28th. Transport Committee. Cadmium copper trolley wire. General manager, Transport Department, 55, Piccadilly.

Morecambe & Heysham.—May 31st. Public Lighting Department. Steel poles, centre suspension units, lanterns, &c. (May 17th.)

Neath.—May 31st. Electricity Department. Equipment of a sub-station at Resolven. (May 17th.)

Newcastle-upon-Tyne.—May 28th. Aerodrome Committee. Lighting equipment for Woolsington Aerodrome. (May 17th.)

New Zealand.—WELLINGTON.—July 1st. Post and Telegraph Department. 5,000 metal cased condensers. (A.Y. 13058.)*

July 9th. 2,500 cord connection strips for telephone instruments. (A.Y. 13061.)*

July 23rd. Insulating compound. (A.Y. 13078.)*

Nottingham.—June 4th. Electricity Committee. General stores for one year from July 1st next. (May 17th.)

Oldham.—June 1st. Electricity Committee. Transformers. (May 17th.)

Pittenweem (FIFE).—May 31st. Town Council. Electrical work at fifty-six houses. MacLennan & Cunningham, architects, 10, Alexandra Place, St. Andrews (deposit £1).

South Africa.—PRETORIA.—June 21st. Union Tender and Supplies Board. Stationary battery for automatic telephone exchange, Porth Elizabeth. (A.Y. 13076.)*

Southampton.—May 28th. Electricity Department. Three-phase transformers and meters. (May 17th.)

Suffolk.—East and West Suffolk Joint Committee for the Care of the Mentally Defective. Electrical work at Kedington Institution, near Haverhill. (May 17th.)

Sutton Coldfield.—June 12th. Electricity Department. 11-kV overhead line, complete with pole-mounted switches, transformers and l.p. equipment. (See this issue.)

Watford.—June 12th. Electricity Department. E.h.p. and l.p. cables for the year ending June 30th, 1936. (May 10th.)

West Ham.—June 13th. Education Committee. Electric lighting of proposed new trade school. (See this issue.)

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, London, S.W.1.

Contracts Closed

Australia.—NEW SOUTH WALES.—Government Railways. Accepted. Single channel carrier telephone system for Sydney-Lithgow section (£1,525).—Standard Telephones & Cables, Ltd.

Bedford.—Electricity Committee. Accepted. Switchgear (£2,522).—British Thomson-Houston Co., Ltd.

Brighton.—Electricity Committee. Accepted. L.p. switchboard extension (£522) and circulating pump motor starter (£82).—G. Ellison, Ltd. One 1,500-kVA transformer (£570).—British Electric Transformer Co., Ltd.

Recommended. Duplicate 30,000-kVA turbo-alternator set (£80,850).—Brush Electrical Engineering Co., Ltd. Four 6,000-kVA auto-transformers.—Hackbridge Electric Construction Co., Ltd.

Darlington.—Town Council. Accepted. Chassis and electrical equipment for three trolley buses.—English Electric Co., Ltd.

Ealing.—Town Council. Accepted. Electrical wiring of Selborne schools (£662).—Fullick & Loosley, Ltd.

Edinburgh.—Education Department. Accepted. Electric passenger lift (£585).—Etchells, Congdon & Muir, Ltd.

L.N.E.R. Accepted. Signalling apparatus at the Waverley station.—Siemens & General Electric Railway Signal Co., Ltd.

Egypt.—Egyptian State Railway. Accepted. Cable.—W. T. Henley's Telegraph Works Co., Ltd. Battery materials.—General Electric Co., Ltd.; Walter's Electrical Manufacturing Co., Ltd. Ceiling fittings.—British Thomson-Houston Co., Ltd. Transformers.—Electric Construction Co., Ltd.

Glasgow.—Housing Committee. Accepted. Electrical installation at Bilsland Drive (£1,559) and Syriam Street and Bardowie Street (£338).—D. Henderson.

Transport Committee. Accepted. Valves for Pinkston power station.—J. Howden & Co., Ltd. Electrodes.—Metropolitan-Vickers Electrical Co., Ltd.; Murex Welding Processes, Ltd.; Welding Rods, Ltd.; Quasi-Arc Co., Ltd. Electric capstan for subway section.—Broadbent & Sons, Ltd.

India.—Indian Stores Department. Accepted. Steel wire and electric cable.—British Insulated Cables, Ltd. Dry charged accumulators.—Chloride Electrical Storage Co., Ltd. Electric cable.—Siemens Bros. & Co., Ltd.

London.—FULHAM.—Electricity Committee. Recommended. Three electric coaling cranes at new generating station (£23,183).—Cowans, Sheldon & Co., Ltd.

L.C.C.—Public Assistance Committee. Accepted. Electric lighting and reorganisation of the fire alarm system at the St. Marylebone institution (£575).—D. Myer & Co. Wiring and fittings for electric lighting, extension to the telephone system, and installation of fire alarm system at the Westminster institution and St. Stephen's hospital (£1,436).—Malcolm & Allan (London), Ltd.

ST. PANCRAS.—Contracts and Stores Committee. Recommended. Transformers.—British Electric Transformer Co., Ltd. (£470); Fuller Electrical & Manufacturing Co., Ltd. (£1,176); General Electric Co., Ltd. (£561). H.p. switchgear.—A. Reyrolle & Co., Ltd. (£1,288); English Electric Co., Ltd. (£581). Additional equipment at King's Road power station (£2,288).—A. Reyrolle & Co., Ltd. Vehicle-actuated traffic control signals.—Siemens & General Electric Railway Signal Co., Ltd. (£1,945); Automatic Electric Co., Ltd. (£1,966). Electrically driven refrigerating plant and chamber (£285).—Lightfoot Refrigeration Co., Ltd. This was the lowest of fourteen tenders, the highest being £468.

HAMMERSMITH.—Electricity Committee. Recommended. Switchgear at Starch Green sub-station (£145).—Ferguson, Pailin, Ltd.

Portsmouth.—Health Committee. Recommended. Power points at St. Mary's hospital for portable X-ray apparatus (£290).—Phillips & Co. This was the lowest of fourteen tenders, the highest being £630.

Electricity Committee. Accepted. House service boxes.—Shervell & Co., Ltd.; G. Cash & Co. Switchgear and kiosks.—English Electric Co., Ltd.

Beach Committee. Accepted. Internal telephones at Hilsea baths (£109).—E. Wyatt.

Surrey.—Public Assistance Committee. Accepted. X-ray apparatus at Reigate Institution (£940).—A. E. Dean & Co.

Tynemouth.—Health Committee. Accepted. Electrical equipment for Moor Park Hospital (£133).—Electrical Equipments, Ltd.

Watford.—Electricity Committee. Accepted. Sub-station switchgear (£450).—Crompton Parkinson, Ltd.

Yarmouth.—Town Council. Accepted. Switchgear (£788).—English Electric Co., Ltd. Twelve months' supply of electric cookers.—Jackson Electric Stove Co., Ltd.

Notes

The I.E.E. London Students' Section

The annual report of the Committee of this section for the past session shows that apart from informal discussions, which are growing in favour, the total number of members attending the twelve meetings which were held was 1,380, as against 830 in the 1933-34 session, and 1,192 in 1932-33. The average attendance at meetings throughout the session was 115, as against 69 for the previous session. The total membership of the section now is 1,736, consisting of 724 graduates and 1,012 students, so that the attendance at meetings was only 6.8 per cent. of the membership. Thirteen visits to works were arranged, the average attendance being sixteen. In some cases applications for tickets far exceeded the number available. The summer outing has been arranged to the Oxford works of Messrs. Morris Motors on the morning of June 1st, with a river trip in the afternoon. Arrangements are in hand for a summer tour this year to Sweden from July 30th to August 15th.

I.E.E. Functions

Members of the Western Centre of the Institution of Electrical Engineers visited Minehead, Somerset, this week-end for their annual outing, assembling at the Hotel Metropole on Friday for the annual general meeting. At the conclusion of business the company was entertained to a dinner and dance by the Metropolitan-Vickers Electrical Co., Ltd.

On Saturday many members enjoyed a tour round the beauty spots in the Minehead district, while others spent their time on the Minehead and West Somerset golf course, where play for the past chairman's cup took place.

An informal dinner and dance in the evening pleasantly rounded off the proceedings.

The I.E.E. Transmission Section Committee is arranging a golf competition to take place at Sundridge Park Golf Club, near Bromley, on Thursday afternoon, June 20th, preceding the Institution's annual conversazione in the evening of that day. The first prize will be a silver cup to be held for one year. A replica will be given to the winner. The number of competitors will be limited and those wishing to enter should send in their names not later than June 12th, to the secretary of the Institution.

The Mersey and North Wales (Liverpool) Centre held its annual golf tournament in aid of the Benevolent Fund at Hoylake on May 15th by the courtesy of the Royal Liverpool Golf Club. The somewhat wintry conditions did not prevent over 100 members and their friends having a very enjoyable day and the committee realising a substantial sum for the Benevolent Fund.

A Large Swedish Electro-magnet

According to the *Elektrotechnische Zeitschrift* an unusually large electro-magnet has recently been installed in the research department of the University of Upsala, Sweden. The magnet, which is stated to be able to hold 60 tons, is provided with an exciting coil of copper tubing through which cold water can be circulated. The excitation current of 140 kW is supplied by an 85-V generator. The magnet is so mounted that it can be adjusted to any required position.

The Electrical Engineers' Ball

We are glad to learn from the Committee of Management of the I.E.E. Benevolent Fund that that fund has benefited to the extent of £244, the amount of the surplus available after defraying all the expenses of the ball held on February 8th last. The attendance was over 1,000.

The Electrolytic Production of Zinc

Some details are given in a recent issue of *Metallwirtschaft* of the new works recently erected at Magdeburg by the Zinkelektrolyse Gesellschaft, the first of their kind in Germany. Blend obtained from the Bleischarley mine in Upper Silesia, after drying by steam, is "grilled" in a battery of four Humboldt nine-stage furnaces, each furnace being capable of dealing with 60 tons of blend per 24 hours. The resulting vapours are passed through an electrical purifier and through cooling towers where they make contact with sulphuric acid. The products of the blend grilling process are stated to result in about 70 per cent. of zinc, which is subjected in solution form to electrolytic treatment in two sets of 240 lead-lined baths in which the zinc is deposited at the rate of about 590 lb. per 24 hours in each bath, the total daily output of the 480 baths being about 120 tons. The recovered zinc, which is stated to be 99.99 per cent. pure, is then melted in 20-ton electric furnaces at the rate of 3 tons per hour and cast into 42-lb. ingots.

B.S.I. Annual Meeting

The British Standards Institution is holding its annual meeting on the morning of Tuesday, May 28th, and afterwards a luncheon will be held at the Royal Automobile Club. Dr. E. L. Burgin, M.P., Parliamentary Secretary to the Board of Trade, and the Rt. Hon. G. W. Forbes, Prime Minister of New Zealand, will be the chief speakers. Other Dominions will also be represented. Dr. E. F. Armstrong, F.R.S., the retiring chairman of the Institution, will preside and will be supported by Mr. W. Reavell (Ipswich), the newly elected chairman for the forthcoming year. Some 150 persons will be present.

Multi-tubular Boilers

The second of the projected series of specifications for land boilers has now been issued by the British Standards Institution. It deals with horizontal multi-tubular boilers of the dry-back and waste heat types, and, while it is generally similar to the specification issued last year for Lancashire and Cornish boilers, it also includes appropriate provisions and rules for tubes and bar stays.

Copies of the specification (B.S.S. No. 609-1935) may be obtained from the Publications Department, British Standards Institution, 28, Victoria Street, London, S.W.1. price 2s. 2d. post free.

St. Paul's Cathedral, Calcutta, illuminated for the Jubilee celebrations

Fatality

Cyril Robinson, aged ten, received a fatal electric shock on May 17th on the District Railway. He was playing with other boys near Addison Road station when a piece of metal which he was carrying came into contact with a "live" rail.

Appointments Vacant

Lecturer in electrical engineering at Loughborough Technical College.

Lady cook demonstrator for Torquay Electricity Department.

Assistant III and draughtsman, grade I, for the Royal Aircraft Establishment, South Farnborough.

Chief showrooms salesman for Heston and Isleworth Electricity Department.

(See our classified advertisements.)

Forthcoming Events

Institution of Electrical Engineers (*South Midland Students' Section*).—Saturday, May 25th. Visit to the British Industries Fair, Castle Bromwich, Birmingham. (*Wireless Section*).—Saturday, May 25th. 9.30 a.m. Visit to the wireless stations at Ongar and Brentwood of Cable & Wireless, Ltd. (*North Midland Students' Section*).—Tuesday, May 28th. Hotel Metropole, Leeds. 7.30 p.m. Annual general meeting. (*London Students' Section*).—Saturday, June 1st. Summer outing.

Association of Mining Electrical Engineers (*South Wales Branch*).—Saturday, May 25th. Esplanade Hotel, Penarth. 5.30 p.m. Annual general meeting.

British Industries Fair, Birmingham. Closing day, May 31st.

National Electrical Convention.—Monday, June 3rd, to Friday, June 7th. Bournemouth.

Tramways & Light Railways Congress.—Wednesday and Thursday, June 5th and 6th. Llandudno.

Our Personal Column

Electrical men are invited to keep readers of the "Electrical Review" posted concerning their movements

I.E.E. Awards.—The Council of the Institution of Electrical Engineers has made the following award of premiums for papers read during the Session 1934-35, or accepted for publication:—Institution Premium: Messrs. N. Ashbridge, H. Bishop and B. N. MacLarty. Ayrton Premium: Messrs. R. Grierson and D. Betts. Fahie Premium: Messrs. W. West and D. McMillan. John Hopkinson Premium: Mr. W. D. Horsley. Kelvin Premium: Messrs. C. E. Webb and L. H. Ford. Paris Exhibition (1881) Premium: Mr. A. Monkhouse. Overseas Premium: Mr. F. T. M. Kissel. Extra Premiums: Messrs. T. E. Allibone, W. G. Hawley and F. R. Perry; C. Wallace Saunders, H. W. Wilson and R. G. Jakeman; E. S. Byng; C. M. Longfield; R. Poole; J. C. Prescott and J. E. Richardson. Wireless Section Premiums.—Duddell Premium: Messrs. C. F. Booth and E. J. C. Dixon. Extra Premiums: Mr. R. H. Barfield; Messrs. C. R. Burch and C. Sykes. Meter and Instrument Section Premiums.—Silvanus Thompson Premium: Mr. N. H. Searby. Extra Premium: Prof. J. T. MacGregor-Morris and Mr. J. A. Henley. Transmission Section Premiums.—Sebastian de Ferranti Premium: Mr. D. M. Robinson. Extra Premium: Messrs. W. J. John and F. M. Sayers. The awards for papers read before the Students' Sections will be announced later.

Mr. H. J. Lamb, formerly production manager of Marco Refrigerators, Ltd., has been appointed to a similar position with British Electric Domestic Appliances, Ltd.

Mr. F. A. Nuttall, charge engineer in the Carlisle Corporation Electricity Department, has resigned to take up an appointment under the Central Electricity Board at Bristol.

Mr. W. Holmes, of Messrs. Ferranti, Ltd., has been nominated for the chairmanship of the Meter and Instrument Section of the Institution of Electrical Engineers for the session 1935-36.

Mr. T. V. Lironi, of the Westmorland & District Electric Power Co., has been appointed assistant mains engineer with the Eastbourne Corporation Electricity Department. Mr. Lironi was educated at St. John's College, Southsea, and the Portsmouth Technical School, and in 1925 was appointed junior assistant engineer with the Gosport & Alverstoke Electric Lighting Co. He afterwards obtained a post with the Portsmouth Electricity Department, and, later, with Messrs. Johnson & Phillips, Ltd., as a superintending engineer. In this latter capacity he supervised the erection of e.h.p. and l.p. overhead lines for the company in many parts of the country.

Mr. E. Hirst, managing director of the British General Electric Co., Ltd., Australia, has arrived in this country on a visit. He is accompanied by Mrs. Hirst and their two children.

Mr. J. R. Colbert, electricity showroom manager to the Rawtenstall Corporation, has been appointed sales engineer by the Canterbury Corporation.

[*Elec. Rev.* photo

Mr. J. R. Walton

Mr. J. R. Walton has been appointed an extraordinary director of the Electrical Apparatus Co., Ltd. Mr. Walton, who has been with the company for twenty-two years, will continue in direct charge of the Control Gear Department. He is a member of several B.E.A.M.A. Committees, including the Motor Control Gear, Gate End Box, and Mining Consultative Committees, and is also a member of the B.S.I. Sub-Committee on Starters and Controllers, and the E.R.A. Sub-Committee on Contactors.

Mr. E. F. Gait, A.M.I.E.E., has been appointed transport engineer by the Johannesburg Municipality at a salary of £900, rising to £1,000, a year. Mr. Gait, who is thirty-two years of age, is assistant engineer in the Durban Corporation Tramways and Motors Department. **Mr. M. L. Merry,** tramways superintendent at Bloemfontein, has been selected for the position of traffic superintendent at Johannesburg, the salary being £850, rising to £1,000. Mr. Merry, who is forty-two, is president of the Association of Road Passenger Transport Undertakings of South Africa. For the position of transport engineer seventy-one applications were received from overseas engineers and forty-two came from men already in South Africa.

The Clarence Dock Power Station Committee of Liverpool Corporation, at its meeting on May 16th, considered the question of remuneration to be paid to **Mr. P. J. Robinson,** city electrical engineer, in respect of his services as consulting engineer in connection with the extension of the station, and recommended that his salary as city electrical engineer should be increased from £1,800 to £3,000 per annum. During the period of construction, extending over four or five years, the proposed increase of £1,200 a year will be chargeable to the Central Electricity Board. The *Liverpool Daily Post* states that Mr. Robinson's present salary of £1,800 is the same as that paid to his predecessor in 1901, Mr. Holmes, when the output was 20 million kWh, as compared with to-day's output of 581 million kWh.

Mr. F. C. Z. Crosse, B.Sc., A.M.I.E.E., who was recently appointed sales manager of Measurement, Ltd., was married on May 4th to Miss Estelle I. Hawkins, M.A. (Cantab.), of Sydenham.

Mr. D. Hepworth, a director of the Craven & District Electrical Construction Co., Ltd., Skipton, recently celebrated his silver jubilee with the company, which he joined on leaving school.

Members of the Western Centre of the Institution of Electrical Engineers at a dance held at the Hotel Metropole, Minehead, during the summer meeting

Mr. R. Lee, chief electrical engineer and manager to the St. Pancras Borough Council, has been recommended by the Parliamentary and General Purposes Committee for an increase in salary from £1,500 to £2,000 per annum, by annual increments of £100, as from January 1st, 1936.

Mr. E. W. Fedden, only son of Mr. S. E. Fedden, M.Inst.C.E., M.I.Mech.E., M.I.E.E., the manager for the Mid-East England Area of the Central Electricity Board, Leeds, is to be married on June 1st to Miss Alfreda Bullmore, younger daughter of Mr. A. W. E. Bullmore, M.Inst.C.E., M.I.Mech.E., of Letchworth.

Obituary

Dr. D. K. Morris.—The death occurred on May 14th at Coventry, of David King Morris, Ph.D., M.I.E.E., at the age of sixty-one. Dr. Morris was educated at University College, London, and the University and Polytechnikum, Zurich. He became demonstrator in electrical engineering and mathematics at S.W. Polytechnic Institute in 1897, then being appointed lecturer in electrical engineering at Mason University, later the University, Birmingham and Edgbaston. He founded the firm of Morris & Lister, of Coventry.

Prof. H. M. Macdonald.—The death is announced of Professor Hector Munro Macdonald, Professor of Mathematics in the University of Aberdeen, at the age of seventy. He had made a close study of the theory of electric waves, and it was largely owing to his work that theory kept pace with practice in this modern study. He was a Fellow of the Royal Society, and his contributions to the mathematical theory of wireless telegraphy were mainly published in the society's "Proceedings."

Mr. W. L. Thain.—The death occurred on May 11th, as the result of injuries received a few days earlier in a motoring accident, of Mr. W. Langford Thain, deputy electrical and tramways manager, Newport (Mon). He had been with the Newport Corporation for thirty-three years, going there as power station superintendent, and had occupied the position of deputy since 1912. He was an associate member of the Institution of Electrical Engineers.

Mr. W. Hewat.—The death occurred on May 15th in Dublin of Mr. William Hewat, chairman of the Dublin United Tramways Co., Ltd.

Will.—Ald. J. Scott, J.P., M.I.E.E., consulting electrical engineer and a member of the Bootle Town Council, left £7,143 (net personalty £6,274).

Financial Section

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares

New Companies Registered

F.R.S. Plastics, Ltd.—Private company. Registered May 15th. Capital, £1,000 in £1 shares (900 6 per cent. cumulative preference and 100 ordinary). Objects: To manufacture and deal in plastic and moulded goods of every description, electrical fittings, equipment and accessories, &c. The first directors are P. E. Suckling and E. L. Suckling, both of "Birts Morton," Barnt Green, near Birmingham. Registered office: 55, Pershore Street, Birmingham.

Bottle Colding Co., Ltd.—Private company. Registered May 18th. Capital, £500 in £1 shares. Objects: To carry on the business of electricians, electrical engineers and contractors, mechanical engineers and manufacturers of and dealers in electrical and other apparatus, &c. The first directors are: A. T. Roberts, 62, Devonshire House, Mayfair, W.1; and W. H. Latchford, 16, Berkeley Square, W.1. Registered office: 14, Bedford Row, W.C.1.

J. E. Swann & Co., Ltd.—Private company. Registered May 17th. Capital, £2,000 in £1 shares. Objects: To acquire the business of electrical engineers now carried on at 53, Victoria Street, Westminster, S.W., and elsewhere, as "J. E. Swann & Co." The permanent directors are: J. E. Swann (chairman), "La Tosca," Wharf Road, Wraysbury; and E. C. J. Baker, Monteagle House, 9, Riverdale Road, E. Twickenham. Solicitors: Kenneth Brown, Baker, Baker, Essex House, Essex Street, Strand, W.C.2.

Lincoln Electric Co., Ltd.—Private company. Registered May 2nd, with a nominal capital of £100 in £1 shares. The objects are to carry on the business of electricians, electrical welders, electrical and mechanical engineers, producers of electricity, motive power and light, manufacturers of electrical and other machinery and apparatus of all kinds, &c. The subscribers are: H. N. Sporborg, 18, Austin Friars, E.C.2, and R. C. G. Clarke, 18, Austin Friars, E.C.2. Solicitors: Slaughter & May, 18, Austin Friars, E.C.2.

Retail Sales, Ltd.—Private company. Registered May 10th. Capital, £100 in 1s. shares (500 "A," 1,000 "B," and 500 unspecified). Objects: To carry on the business of dealers in all kinds of wireless apparatus, gramophones and other musical instruments, vacuum cleaning machines, electrical polishing machines, &c. The permanent directors are: A. C. Beckley, 4, Chesham Road, Amersham, Bucks, and two others. Registered office: 26, High Street, Chesham, Bucks.

Lorraine Carbons, Ltd.—Private company. Registered April 29th. Capital, £100 in £1 shares. Objects: To carry on the business of manufacturers of and wholesale and retail dealers in all kinds of electrical and other carbon articles, agents for and dealers in battery and arc-lamp carbons, &c. The first directors are: E. Chedeville, 21, Boulevard Delessert, Paris, 16e (director Cie Lorraine de Charbons, pour Electricité, S.A.); Julien Monchalin, 186, Rue de Vaugirard, Paris, 15e, engineer. Secretary: Cyril A. Prophet. Registered office: 73, Basinghall Street, E.C.

Radio & Electrical Services (Beaminster), Ltd.—Private company. Registered May 15th. Capital, £1,000 in £1 shares. Objects: To carry on the business of electrical and radio engineers, dealers in electrical and radio products, &c. The first directors are: E. E. C. Marsh, Chilcombe, Bridport, Dorset, and E. R. Marsh, Seatown Farm, Chideock, Dorset. Registered office: London House, White Hart, Beaminster, Dorset.

Croxtons Insulations, Ltd.—Private company. Registered May 13th. Capital, £4,550 in 4,000 7 per cent. preference shares of £1 and 11,000 ordinary shares of 1s. each. Objects: To carry on the business of technical insulation engineers, and to exploit and develop all systems of insulation, &c. The subscribers are: E. J. Evershed, Thanet House, 231, Strand, W.C.2, and A. G. Pitts, Thanet House, 231, Strand, W.C.2. Solicitors: Helliwell, Harby & Evershed, Thanet House, 231, Strand, W.C.2.

Lomax & Samways, Ltd.—Private company. Registered May 13th. Capital, £750 in £1 shares. Objects: To acquire the business of electrical engineers and contractors carried on by Herbert H. Lomax and Geo. E. Samways, at Cheadle Hulme, Cheshire. The first directors are: J. Fletcher, Deepdale, Jackson Edge, Disley, and two others. Silicitors: Jackson, Barrett & Gass, Stockport.

Space Heating, Ltd.—Private company. Registered May 15th. Capital, £200 in 10s. shares. Objects: To carry on the business of manufacturers, distributors and salesmen of low tension, electric, and tubular and other heating apparatus, &c. The first directors are: R. H. Wheat, 20, Bilton Grove Avenue, Harrogate, and two others. Registered office: 46, Park Square, Leeds, 1.

Returns of Electrical Companies

William J. Hook & Co., Ltd.—Capital, £1,000 in 500 preference and 500 ordinary shares of £1. Return dated December 31st, 1934. 400 preference and three ordinary shares taken up. £403 paid. Mortgages and charges, nil.

R. Fairshaw, Ltd.—Capital, £5,000 in £1 shares. Return dated December 31st, 1934. All shares taken up. £2 paid. £4,998 considered as paid. Mortgages and charges, nil.

Richson & Co. (1925), Ltd.—Capital, £15,000 in £1 shares. Return dated December 31st, 1934 (filed March 5th, 1935). 14,660 shares taken up. £2 paid. £14,658 considered as paid. Mortgages and charges, nil.

Neon Manufacturers, Ltd.—Further charge on various contracts, &c., dated May 3rd, 1935, to secure £255, supplemental to mortgage debenture dated February 15th, 1935, and further charges dated March 28th, April 5th and April 18th, 1935. Holders: Tudor Investment Trust, Ltd

Tredegars, Ltd.—Hubert Baker, 4, Broad Street Place, E.C.2, ceased to act as receiver and manager on April 26th, 1935.

Specialities (Liverpool), Ltd.—Debenture charged on the company's undertaking and property, present and future including uncalled capital, dated May 1st, 1935, to secure all moneys due or to become due from the company to Lloyds Bank, Ltd.

Gyrotone, Ltd.—First and second debentures, both dated April 27th, 1935, and charged on the company's undertaking and property, present and future, to secure £2,864 15s. and £1,700 respectively. Holders: (A) Chas. H. Wynn, The Hall Farm, Knowle and (B) John Wynn, The Aerial, Balsall Common, near Coventry.

Amalgamated Battery Co., Ltd.—Debenture dated May 8th, 1935, to secure £600 charged on the company's undertaking and property, present and future, including uncalled capital. Holder: H. G. N. Lee, 24, John Street, Bedford Row, W.C.1.

Rangoon Electric Tramway and Supply Co., Ltd.—Satisfaction to the extent of £100,000 on February 28th, 1935, of trust deeds dated November 13th, 1913, and registered December 3rd, 1913, securing £300,000 5 per cent. mortgage debenture stock.

Broom & Wade, Ltd. (in voluntary liquidation).—Satisfaction in full on March 30th, 1935, of debenture in favour of Barclays Bank, Ltd., dated October 21st, 1927, and registered October 29th, 1927. (According to the register of mortgages, the debenture registered October 29th, 1927, originally secured all moneys due to bank.)

Electrical Wiring Investment Co., Ltd.—Satisfaction to the extent of £700 on December 25th, 1934, of mortgage dated September 23rd, 1930, and registered October 11th, 1930. (Notice filed May 9th, 1935.)

Peacock Radio, Ltd.—(A) Debenture dated April 17th, 1935, to secure £205, charged on the company's undertaking and property, present and future, including uncalled capital. (B) Further charge, as above, dated May 1st, 1935, to secure £20. Holder: Elizabeth A. Lawrence, Arrandale, Beechwood Road, Swansea.

Globe & Simpson, Ltd.—The nominal capital has been increased by the addition of £4,000 in £1 ordinary shares beyond the registered capital of £8,000.

Huntalite, Ltd.—Capital, £2,000 in £1 shares. Return dated December 3rd, 1934. 1,800 shares taken up. £1,500 paid, £300 considered as paid. Mortgages and charges nil.

Herne Bay Relay Services, Ltd.—Land registration charge on "Brooklyn," Canterbury Road, Herne Bay, dated April 23rd, 1935, to secure all moneys due or to become due from the company to the Midland Bank, Ltd.

Watamps, Ltd.—The nominal capital has been increased by the addition of £1,500 beyond the registered capital of £500. The additional capital is divided into 6,000 ordinary shares of 5s.

Nivalight (1928), Ltd.—Capital, £5,000 in £1 shares. Return dated November 23rd, 1934. All shares taken up. £5,000 paid. Mortgages and charges nil.

Hill & Co. (Radio), Ltd.—E. Groom, 728, Christchurch Road, Boscombe, Hants, was appointed receiver and manager on May 7th, 1935, under powers contained in debenture dated June 23rd, 1932.

Lloyd & Ramsden, Ltd.—T. J. M. Macleod, 1 and 2, Bucklersbury, E.C., was appointed receiver and manager on May 13th, 1935, under powers contained in mortgage or charge dated June 29th, 1933.

Ridout & Ratcliff, Ltd.—Two notices of the appointment of L. A. C. Ridout, 42, Upper Gloucester Place, N.W.1, as receiver and manager on May 13th, 1935, under powers contained in debentures dated January 27th, 1930, and June 22nd, 1933.

R. A. P., Ltd.—The nominal capital has been increased by the addition of £3,000 beyond the registered capital of £13,000. The additional capital is divided into 1,000 preferred ordinary shares of £1 each and 40,000 ordinary shares of 1s. each.

Block Batteries (formerly Fullers (Ilford), Ltd.).—Capital, £52,500 in 40,000 preference shares of £1 and 500,000 ordinary shares of 6d. each. Return dated December 31st, 1934 (filed March 1st, 1935). 17,687 preference and 407,200 ordinary shares taken up. £27,887 paid. Mortgages and charges at date of return: £18,000. Since issued, £2,000 on February 21st, 1935. Returns of allotments made up to February 22nd, 1935, show a further 600 preference shares allotted for cash.

Variable Power Transmissions, Ltd.—Capital, £30,000 in 25,000 preference shares of £1 and 100,000 ordinary shares of 1s. Return dated December 28th, 1934 (filed February 19th, 1935). All shares taken up. £13,000 paid on 10,000 preference and 60,000 ordinary shares. £17,000 considered as paid on 15,000 preference and 40,000 ordinary shares. Mortgages and charges, nil.

Great Asby Electric Light and Water Co., Ltd.—Return dated December 28th, 1934. Capital, £2,000 in £5 shares. 282 shares taken up. £1,410 paid. Mortgages and charges, nil.

Imeson & Finch, Ltd.—Capital, £2,500 in £1 shares. Return dated December 31st, 1934 (filed March 30th, 1935). 1,400 shares taken up. £1,400 paid. Mortgages and charges, nil.

Shepherd & Co. (Salford), Ltd.—Capital, £500 in £1 shares. Return dated December 20th, 1934. 478 shares taken up. £239 paid. £239 considered as paid. Mortgages and charges, nil.

Burma Electric Supply Co., Ltd.—Capital, £270,000 in 150,000 6 per cent. cumulative preference and 120,000 ordinary shares of £1. Return dated December 12th, 1934. 120,000 preference and 120,000 ordinary shares taken up. £100,000 paid on 100,000 preference shares. £140,000 considered as paid on 20,000 preference and 120,000 ordinary shares. Mortgages and charges, nil.

Ferguson Radio Corporation, Ltd.—Particulars filed of £2,000 debentures, authorised April 12th, 1935, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

Associated Radio Distributors (Yorkshire), Ltd.—Capital, £500 in £1 shares. Return dated Sept. 18th, 1934 (filed March 16th, 1935). 200 shares taken up. £200 paid. Mortgages and charges nil.

Radio Rentals, Ltd.—Charge on hiring agreements, the goods to which they relate, and all moneys due or to become due thereunder, dated May 9th, 1935, to secure sums from time to time owing to Associated Distributors, Ltd., Vernon House, Friar Lane, Nottingham, not exceeding £2,800.

Initial Radio Service, Ltd.—The nominal capital has been increased by the addition of £2,500 in £1 ordinary shares beyond the registered capital of £1,000.

London Radio Manufacturing Co., Ltd.—Capital, £1,000 in £1 shares. Return dated December 31st, 1934 (filed January 23rd, 1935). All shares taken up. £700 paid, £300 considered as paid. Mortgages and charges nil.

City Notes

Edmundson's Electricity Corporation, Ltd.—Referring to the annual report (see our last issue, page 731), Sir Holberry Mensforth, chairman, stated at the annual general meeting of the company on Tuesday that the year had been one of continued progress, and all the undertakings which they controlled or in which they were interested had shown improvement. The early business of the company was that of electrical contractors, and he was happy to report that considerable effort was being directed to the enlargement of the activities of this department. Their subsidiary companies had continued, wherever possible, the policy of rural development, and during 1934 electricity sold by their subsidiary and associated companies amounted to 467 million kWh, as compared with 393 million kWh in the preceding year—an increase of 16 per cent.; the average increase over the whole country was 14 per cent. At the end of December consumers totalled 258,000, as compared with 216,000 at the end of 1933, while connected supplies over the whole area of approximately 14,600 sq. miles amounted to 675,000 kW, an increase of over 16 per cent. At the end of March, 1935, there were over 269,000 consumers. In a number of the undertakings considerable reductions in charges had been made, and they were encouraged to hope that the progressive results would in due course be reflected in the accounts. The payment of £169,334 out of the total gross receipts of £2,910,659 in respect of parochial rates had a serious influence upon the trading results of the undertakings, and was a factor which was likely to be more serious as time went on. In carrying out developments the directors had kept closely in mind the necessity for expanding into areas where there was a prospect of a reasonable return on a capital employed. In making electricity available over large territories such as those with which the associated companies were entrusted the proposition was entirely different from the provision of supplies in large industrial towns or thickly populated areas, and it was found that it took on an average about six years for the capital to be turned over. Electricity could never be supplied in remote districts at rates which would meet the views of a certain section of the public who gave no thought to the value of the service and at the same time secure even a moderate return on the capital expenditure involved. That rights had been waived for a number of years in connection with the acquisition of the Cambridge, Glossop and Berwick undertakings showed that the local authorities had confidence in their organisation and management. In Sir Holberry's opinion the consumers in the areas over which the group operated were fortunate in having available an electricity service at prices which were reasonable and economic, particularly when true comparisons were made with prices charged in cities and towns where the density of the population enabled more economic distribution to be effected. Since the setting up of the four main centres of administration they had taken a further step by moving their London administration to Thames House, Millbank. In conclusion, Sir Holberry paid a warm tribute to the services of the executive officers and staff. The report and accounts were adopted, and the chairman and directors re-elected unanimously.

The Urban Electric Supply Co., Ltd., held its annual meeting on May 16th, Sir Holberry Mensforth (chairman), presiding. In presenting the report and accounts (ELEC. REV., May 10th, p. 687), the chairman said that the number of consumers connected to their mains and to the mains of the subsidiary companies at December 31st last was 48,764, of which 8,878 were added during the year. The connections increased by 14,577 kW, making the total load connected at the end of the year 84,937 kW. The sales of electricity totalled 38,912,000 kWh, as compared with 29,462,000 in 1933. Negotiations had been concluded with the Borough Councils of Glossop and Berwick whereby they had undertaken to change the system of supply from d.c. to a.c., and to institute a new scale of tariffs, which would probably mean a reduction of £4,000 per annum in the existing charges to consumers. In return they had received an extension of tenure for a further period of seven years. They were conducting negotiations on similar lines with the Grantham and Hawick Borough Councils. Their Cornish undertakings, coupled with the steady progress maintained in the tin-mining industry, had shown a marked improvement during the past year. In Cornwall they had in hand a scheme of development to cost £271,000 which, when completed, would provide a network of overhead mains linking up with existing lines, making available a supply to many small villages and local industries. The Cornwall Electric Power Co.'s station at Hayle had been operating as a selected station since January 1st last. Referring to the recently acquired subsidiary, the East Anglian Electric Supply Co., Ltd., he said that this company added 4,470 consumers and increased the load connected by 6,822 kW, the sale of electricity increasing by 2,697,000 kWh, or 49 per cent. During the past year 134 miles of h.p. lines and 80 miles of l.p. mains were completed. This development was still further being pursued during the current year. In March, 1934, revised tariffs were introduced which gave a reduction of charges to practically all classes of consumers, and the effect of this reduction was that the profits of the company had not kept pace with the amount of electricity sold. They were hopeful, however, that this position would soon adjust itself.

The London Electric Wire Co. & Smiths, Ltd., held its annual meeting on May 16th, Mr. W. J. Terry (chairman and joint managing director) presiding. In presenting the report and accounts (ELEC. REV., May 17th, p. 731) the chairman said they had continued their policy of making adequate provision for depreciation, and for obsolescence of plant and machinery, and during the past year a number of their older machines had been superseded by machines of the latest design. Their subsidiaries were working at a profit, with small exceptions, for which full provision had been made. The prices of their raw materials during 1934 remained constant, with the exception of electrolytic copper, which showed a falling tendency. During the early part of 1935, however, the copper producers had agreed upon a restriction scheme which he hoped would have the effect of stabilising the price of copper at an economic level. From the beginning of 1934 the sales of the company showed an improvement over the previous year, the tonnage output being approximately 30 per cent. higher than last year—in fact the highest turnover so far recorded. The selling prices, however, showed a falling tendency due to intensive competition in respect of some of their manufactures. Otherwise the profit figures would have been considerably augmented, and would have more fully reflected the increase in tonnage output. Their position in overseas markets had been maintained in face of severe competition from home and foreign manufacturers, and in spite of the restricting influence of unstable foreign exchanges. During the year every possible attention had been given to development and research and satisfactory progress had been made. With regard to the future, there was a definite improvement in trade during last year, and there was no doubt that there would be an increased use of electricity in the future. How rapidly it would increase was difficult to predict, but he expected further benefits to accrue from this cause. During last year efforts were continued to secure co-operation between manufacturers in the industry in order to minimise uneconomic competition. Arrangements of this nature, however, were extremely difficult to effect because, unless they were fair and equitable to all parties, they could not be maintained over any appreciable period. Their company was in a sound financial position with sufficient liquid resources to take full advantage of any expansion of trade which might arise.

The Oriental Telephone & Electric Co., Ltd.—Presiding at the annual meeting held on May 14th, Sir A. Henry McMahon (chairman) said that their branch in Singapore showed an increase of 236 exchange lines for 1934 and there was every indication that their position of 1930 would have been regained, if not surpassed, by the end of next year. A small increase in the number of exchange lines was recorded in Mauritius, but the position was much the same as it was at the time of the last annual meeting. The Bombay, Bengal and Madras Telephone Companies had made good progress, and considerable capital expenditure would be necessary by the Bombay Co. during the next few years in order to meet the growing demands of the public. The Rangoon Co. maintained its dividend at 6 per cent., but both its revenues and the number of exchange lines working continued to show a slight falling-off. There was also a slight decrease in the number of exchange lines worked by the Hongkong Co. The growth of this company's system during the last ten years had been phenomenal, and it was a matter of surprise that it should not have experienced before now the effects of the general depression. It was maintaining its dividend at 12 per cent.

The Cawnpore Electric Supply Corporation, Ltd., held its annual meeting on May 14th. Mr. K. A. Scott-Moncrieff (chairman), who presided, in the course of his speech said that the introduction of the new plant cost them about £110,000. They had disposed of the generating plant at the Mall Road station and had converted the buildings to other uses. They had made material reductions in their charges to all consumers and entered upon the current year with the knowledge that these reductions would reduce the margin of profit on existing supplies. Their agents in Cawnpore reported that there was a general improvement in trade during 1934, and that there were signs of a continuance of these better conditions. They anticipated having to make further additions to their generating plant. Mr. Moore, their chief engineer, would be in London within the next few days, and on his arrival they would proceed at once to formulate their plans. Mr. Moore had decided to make his home in this country, and they had arranged to retain his services in an advisory capacity.

The Calcutta Tramways Co., Ltd., held its annual meeting on May 14th, when Sir Geoffrey R. Clarke (chairman), who presided, said that the increase of expenditure on capital account during the year amounted to £58,117, mainly expended on the supply of additional cables, new sub-stations, thirty new articulated units and the provision of air brakes on other cars. Orders had been placed for a further number of articulated units which would be brought into use during the current year and the early part of 1936. They carried upwards of 98,000,000 passengers, which represented an increase of more than 4,000,000, the mileage run being 9,448,630, an increase of 294,621 miles. With the limited track mileage which existed to-day in Calcutta receipts could not be expected to continue to increase indefinitely, but there was no reason why they should not be maintained at their present level, and the returns for 1935 up to date fully justified that hope. The

company had already applied to the authorities for sanction to construct various extensions of their lines, but up to the present this had not been granted.

Siemens Bros. & Co., Ltd., in their report for the year ended December 31st last, state that their business during the year had shown progressive improvement month by month over the low output for 1933, but it was not until the second half of the year that the turnover reached a satisfactory level. Thus the full benefit of the revival is not reflected in the present accounts. Nevertheless, the profit for the year rose from £42,265 in 1933 to £144,148 in 1934. The increase in orders has extended to all departments except the submarine telegraph cable section, for which orders have been very sparse, nor has there been any opportunity during the year for using the company's cable steamer *Faraday* which, however, has been kept well maintained, and will be required in September next to lay a cable being made by the company to connect Tasmania with Australia. With the balance brought in the amount available is £510,001, and it is proposed to maintain the ordinary dividend for the year at 4 per cent., leaving £332,985 to be carried forward. Meeting: May 27th.

The Southern Areas Electric Corporation, Ltd., reports a profit for 1934 of £8,329, against £6,472 for the period May 6th to December 31st, 1933. A final dividend of 2½ per cent. is declared, making 4 per cent. for the year, the same as for the previous period, and a balance of £2,415 is carried forward, against £2,080. At the annual meeting on May 29th a resolution will be submitted for increasing the capital to £850,000 by the creation of 500,000 additional ordinary £1 shares. Since December, 1934, the share capital of the Brentwood District Electric Co. and Brentwood District Electric Installations, Ltd., has been acquired, and the company has also purchased the preference shares of Mawdsleys, Ltd., and has contracted to purchase by December 31st, 1936, the whole of the issued ordinary shares of that company. In connection with these acquisitions and the development of its other undertakings the company has obtained temporary advances from its bankers and intends to issue further capital to pay off these advances and to provide funds for further developments.

The Craigpark Electric Cable Co., Ltd., reports a profit of £3,208 for the year ending March 31st, 1934, as compared with a loss of £10,117 for the preceding year. To this is added £3,522 brought in, making £6,730 available, from which is deducted £3,000 for depreciation of plant and machinery and £750 appropriated for directors' fees, leaving £2,980 to be carried forward. The trading results for the year show an improvement over the previous year, but the directors regret that the results do not justify the payment of any preference or ordinary dividend. There was an increase in the output for the year, but continued low prices and keen competition have affected the results. Throughout the year steps were taken to effect economies and reduce costs wherever possible, the results of which should be reflected in future accounts.

The Hollandsche Draad en Kabelfabriek reports a loss of 202,000 fl. for 1934 as compared with one of 330,000 fl. in the previous year. The report states that the principal competitor (Germany) by agreement obtained a quota about equal to the imports in 1933. Thus the expected considerable increase in the turnover of the Netherlands industry through a large diminution in the imports was not obtained. Concerning the export trade the report states that the decrease for the whole of the year was not so large as in 1933, but the decline became accentuated about the close of the year. Through the hindrances and changes in export markets the company's exports were diminishing. The directors regard the future with extreme anxiety and are leaving no means untried in order to obtain better results.

Cable & Wireless (Holding) Co., Ltd., reports that the dividends receivable from subsidiary companies for 1934 amounted to £1,078,651, which with transfer fees and interest amounting to £1,741, makes a gross revenue of £1,080,392, as compared with £720,064 for 1933. The net profit is £986,901, an advance of £324,606, and with £99,276 brought in, the disposable balance is £1,086,177. It is proposed to pay a dividend of 4½ per cent., less tax on the cumulative preference stock, being the balance of the dividend in respect of 1932 and a payment of 1⅜ per cent. on account of the year 1933. This will absorb £957,779, leaving £128,398 to be carried forward. Meeting: May 24th.

Cable & Wireless, Ltd., reports a total revenue for 1934 of £4,777,281, as compared with £4,576,532. In addition to the ordinary expenses there has been provided £135,882 for cable renewals and the sum of £68,000 has been written off in respect of losses of subsidiary companies and the cost of terminating a joint purse agreement and other expenditures, leaving a profit for the year of £625,546, an increase of £415,994 on 1933. To this is added £60,576 brought in, making £686,122 available, out of which it is proposed to pay a dividend of 2 per cent., and to carry forward £86,122.

The West Devon Electricity Supply Co., Ltd., reports a profit for 1934 of £12,907 (against £8,176) to which is added £1,041 brought in. A dividend of 4 per cent. (less tax) is to be paid on the ordinary shares (same) and £1,074 is to be carried forward. The report states that contracts were concluded for supplying electricity in bulk to the Holsworthy Electric Supply Co., Ltd., and the Bude Electric Supply Co., Ltd., and there were substantial increases in the number of consumers and the amount of electricity sold.

Richard Johnson & Nephew, Ltd., report a net profit of £25,561 for the year ended March 31st, including profit of £9,169 on sale of investments, against £29,292 for the previous year. It is stated that the dividend on the ordinary shares is to be reduced from 7 per cent. to 4 per cent. The balance carried forward is £32,777. The report adds that from June last a large number of employés ceased work and the departments affected were forced to close down for three months, only being able to recommence work in October last. Meeting: May 29th.

The Sphere Investment Trust, Ltd., reports a net revenue for the year ending March 31st, 1935, of £39,548 (against £32,838), to which is added £12,108 brought in. A dividend of 3 per cent. is to be paid (less tax), on the ordinary shares, as compared with 2 per cent. for the previous year, and a balance of £13,101 is to be carried forward. The directors report that a further £225,000 4 per cent. first charge debenture stock was sold to the Power Securities Corporation, Ltd., during the second half of the year.

The Dubilier Condenser Co. (1925), Ltd., reports a profit of £20,095 for the year ended March 31st, 1934, as compared with £17,799 for the previous year. After transferring £4,000 to general reserve it is proposed to pay a dividend of 15 per cent. on the ordinary shares (against 10 per cent.), leaving £7,849 to be carried forward. The company states that there was a larger turnover during the year, but the average sale price of its products was lower than in the previous year.

The Delhi Electric Supply & Traction Co., Ltd., reports for 1934 a profit of £50,963 (against £53,143) and £74,529 is available after adding £23,565 brought in. The final dividend is 8 per cent. (free of tax) making 12 per cent. for the year (same) and £24,031 is to be carried forward. During the year there was an increase from 6,897,265 kWh to 7,723,131 kWh in the sales, but the passengers carried by the transport undertaking fell from 7,516,926 to 7,345,676

Chloride Electrical Storage Co., Ltd., reports a net profit for the year ended March 31st of £422,000, as compared with £244,910 in 1933-34. It is proposed to place £150,000 to reserve (against £125,000) and to pay final dividends of 5 per cent. on the "A" and "B" ordinary shares, plus a bonus of 5 per cent. (against nil), making the total distribution for the year 15 per cent. (against 10 per cent.). Meeting: June 7th.

Eastern Extension, Australasia & China Telegraph Co., Ltd., reports an income of £426,511 for 1934, against £329,476 for 1933. After deducting debenture interest there is a balance of £381,096 (£280,964). To this is added £2,177 brought in, making £383,273 available. A dividend of 9½ per cent. is recommended on the ordinary stock as compared with 7½ per cent. for the previous year, and the balance carried forward is £3,273.

The Eastern Telegraph Co., Ltd., reports an income of £444,195 for 1934 (against £257,532), and after deducting debenture interest, &c., a profit of £353,646 (against £171,961), which enables the dividend on ordinary stock to be raised from 2 per cent. for 1933 to 5½ per cent. The balance carried forward is £10,791 as compared with £2,145 brought in.

The Western Telegraph Co., Ltd., reports an income for 1934 of £342,988 as compared with £253,413 for 1933. A balance of £300,390 is obtained after deducting debenture interest, and to this is added £1,192 brought in. A dividend of 9½ per cent. is paid on the ordinary stock, against 6¾ per cent., and the amount carried forward is £5,282.

Marconi's Wireless Telegraph Co., Ltd., reports a profit of £225,733 for 1934 (against £126,553), to which is added £11,198, making £236,932. After deducting £78,000 as a reserve for contingencies and allocating £11,000 for staff bonus it is recommended that the 6 per cent. dividend on the ordinary shares be maintained, leaving £9,224 to be carried forward.

The Great Northern Telegraph Co., Ltd., of Denmark, reports net receipts for 1934 of £399,882, as compared with £402,442 for the preceding year, which with £490,371 brought in, makes £889,954. The dividend and bonus for the year is maintained at 20 per cent., and £487,721 is carried forward.

Telephone Rentals, Ltd., has announced a final dividend of 4½ per cent., making 8 per cent. for the year (against 7½ per cent.). The directors have decided to issue a further 400,000 5s. shares at 7s. 6d. per share. These will be issued to shareholders in the ratio of one new share for every six held.

Wisbech Electric Light & Power Co., Ltd., reports a balance for 1934, after deducting administration expenses, &c., of £6,998, to which is added £3,100 brought in, making £10,098 available. The ordinary dividend for the year is maintained at 10 per cent., and the balance carried forward is £2,535.

Meters, Ltd., reports a net profit of £20,402 for 1934 as compared with £21,333 for 1933. The final ordinary dividend is 6½ per cent., making 9 per cent. for the year (same) and £6,789 is carried forward.

The Electric Furnace Co., Ltd., has declared a final ordinary dividend of 4½ per cent., making 7 per cent. for the year (unchanged).

Stocks and Shares

TUESDAY EVENING.

THE various markets of the Stock Exchange, and more particularly those concerned with the stocks and shares of industrial companies, exhibit a degree of animation which, it may be confessed, surprises some of those who are called upon to handle the large volume of business that is now passing. On the whole, buyers are in the majority. The demonstrations of the Silver Jubilee time have undoubtedly deepened the feeling of confidence that exists in connection with British Government and industrial securities. It is true that labour is engaged in a mild dispute with the railway companies; and, until some settlement is reached, prices of Home Railway stocks are likely to be left out in the cold, so far as any sharing of investment attention is concerned. On the other hand, the Cable and Wireless combine has published figures which make the best April showing of the past five years. Prices of the stocks have duly responded, and optimism is rife in regard to the possibility of a further payment of arrears.

Gilt-edged Stocks

Central Electricity stocks are good, with the fives of 1950-1970 a point higher at 116. London Passenger Transport issues hold their last week's improvements. The Jubilee traffics gave the Board last week a huge increase in revenue. The "C" stock revolves around 100. It would almost appear as though there were a good many selling limits in the market

to be executed at that price, for the stock, in spite of the continual flow of investment money into it, keeps round about this par level. It is reasonable to expect, however, that when the present selling has been finished, the investors who have bought the stock for permanent holding will find their expectations realised of appreciation in the capital value.

Electricity Supply Shares

No changes of consequence have occurred in the lists of London or provincial Electricity supply companies' shares. There continues to be a steady absorption of the Charing Cross new 3½ per cent. debenture stock. A moderate line on offer at 100¼ was soon absorbed, and the price is now 101. The stock can be bought free of stamp and fee. Edmundson's are a shade harder at 43s. 4½d. Electric Finance & Securities shares strengthened to 67s. Hendons are a little easier at 53s. 3d.

British Light & Power hold their price at 27s. 3d., Atlas at 5s. 6d. In the Colonial group, Kalgoorlie at 15s. 6d. are a few pence easier, Calcutta Electrics a trifle better at 66s. 3d.

Cable and Wireless

Cable & Wireless (Holding), Ltd., announces a net balance available in respect of last year of £987,000, showing an improvement of £327,000. The dividend lately declared on the 5½ per cent. preference stock of 4½ per cent. is regarded as the 2¾ per cent. balance dividend for 1932, and 1¾ per cent. in respect of 1933. This leaves 9⅜ per cent. of dividend arrears. It has been said here on many occasions that the combine started grossly over-capitalised in 1928. Unfortunately, as things turned out, trade throughout the world fell away soon after the combine, as such, started operations. Income shrank in a manner which could scarcely have been foreseen; and, with its over-loaded capital account, Cable & Wireless fell into dividend arrears on its preference stock soon after the merger commenced business. The price of the "B" stock, which touched nearly 100 in 1928, is now 6½. The "A" ordinary, from three figures, has dropped to 19½, which latter figure shows a rise on the week of 1¾ points. The preference stock is 4 higher at 89.

Globe ordinary shares are up £1, to 14, by reason of the Cable & Wireless rally. The preference have put on 2s. 6d., following upon last week's gain of 7s. 6d.

Several Strong Features

One of the outstanding features of the week has been a jump in the prices of Chloride Electrical Storage "A" and "B" shares. These were standing at 60s. a week ago, but the prices rose to 66s. 3d. upon an increase in the dividend, from 10 per cent. in 1932, to 15 per cent. for last year. The profits advanced from £203,000 to more than double that amount, and the report and accounts, which have been issued by the company make an exceedingly good showing. Another feature has been a spurt in Ericsson Telephones to 6⅞, upon investment buying that declines to be gainsaid in its appetite for the shares. Yorkshire (West Riding) Tramway shares at 32s. show a gain of 3s. 3d. The dividend was recently raised, from 5 per cent. to 6¼ per cent. Moreover, traction companies' shares are in request. British Electric Traction 8 per cent. preferred is 2 up, at 170.

Manufacturing and Equipment

Telephone Manufacturing shares, after being up to 7s. 6d., are a little easier at 6s. 10½d. The rise is due to statements from quarters usually well informed, to the effect that the company is doing big business, and that the present year's results are likely to exceed substantially those of 1934. Telephone Rentals eased off to 9s. 7½d., after being half-a-guinea. Of the higher-priced shares, Henleys at 6¾ show ⅛ reaction.

British Aluminium, at 37s., have further improved, in consequence of the impression that the company is securing important orders from aircraft undertakings. General Electrics are better at 33s. 9d., on dividend expectations of 10 per cent. as against the previously paid 8 per cent. The announcement is due this week. Siemens recovered to 22s. 6d, after being 21s. 3d. on a little profit-taking. The company's profits for 1934 were £144,000, against £42,000 in the previous year. As previously stated, the dividend is maintained at 4 per cent. Rises of 1s. each have lifted Electric Construction to 17s. 6d., English Electrics to 10s. 9d. Associated Equipment are a good market at 37s. 6d. Electric & Musical Industries shares have been a good spot, with a rise to 27s. 6d. There is not much doing in the Baird trio of shares.

Miscellaneous Matters

Demand from the Continent is responsible for a rise of 10s. to 40 in Great Northern Telegraphs. Anglo-American Telegraph stocks are distinctly better. American Telephone & Telegraph strengthened to 123½. Internationals are 8¼. The tendency in the market for American utilities is inclined to be cautious. Nearly every week a speech, well-advertised in advance, is made either by the President or by one of his ministers, the effect being to keep the market in a state of perpetual suspense. Rises in copper and base metal shares have provided a bull point, but uncertainty is never good for the prices of stocks and shares, and the public, in spite of frequent admonitions that the present is the time to buy Americans, are keeping aloof, leaving the market to the insiders. There is vague talk of a coming rise in the price of rubber; the quotation keeps closely to 6d. per lb., without, however, there being much evidence of increased consumption.

Share List of Electrical Companies

HOME ELECTRICITY COMPANIES.

	Nom.	Dividend 1933.	Dividend 1934.	Price. May 21	Rise or Fall.	Yield. p.c. £ s. d.
Bournemouth and Poole	1	15	15	76/3	—	3 18 9
Brompton Ordinary	1	7	7	33/6	—	4 3 7
Charing Cross Ordinary	1	7	7	33/9	—	4 3 0
Chelsea	1	7	7	33/6	—	4 3 7
City of London	1	7½	7½	36/-	—	4 3 4
Clyde Valley	1	7	8	42/6	—	3 15 2
County of London	1	10½	10½	57/6	—	3 13 1
Edmundson's 7% Pref.	1	7	7	35/6	—	3 19 0
Elec. Dis. Yorkshire	1	9	9	48/-	—	3 15 0
Elec. Supply Corporation	1	11	11	3/-	—	3 11 10
Kensington Ordinary	1	7	7	33/6	—	4 3 7
Lancs Light and Power	1	7½	7½	38/-	—	3 19 0
London Electric	1	7	8	37/6	—	3 14 8
Metropolitan	1	10	10	53/6	—	3 14 9
Mid'and Counties	1	7	7	38/-	—	3 13 8
Mid. Elec. Power.	1	8	8	39/6	+9d.	4 1 0
North Eastern Electric Ordinary	1	6	6	34/-	—	3 10 8
Do. 7% Pref.	1	7	7	35/-	—	4 0 0
Northampton	1	10	10	55/9	—	3 11 9
Notting Hill 6% Pref.	10	6	6	14½	—	4 2 9
North Met. Elec. Ordinary	1	10	10	62/-	—	3 4 6
Do. do 6% Pref.	1	6	6	31/6	—	3 16 2
St. James and Pall Mall	1	7	8½	33/6	—	4 18 6
Scottish Power	1	8	8	41/9	—	3 16 8
South London	1	7	7	35/0	−6d.	4 0 0
Westminster Ordinary	1	7	7	38/6	—	4 3 7
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	27/6	—	5 9 1
Yorkshire Elec.	1	8	8	44/6	—	3 12 0

PUBLIC BOARDS.

Central Electricity 1950–70	Stock	5	5	116	+1	4 6 2
Do. 1955–75	,,	5	5	118	—	4 4 9
Do. 1951–73	,,	4½	4½	111	—	4 1 1
Do. 1963–93	,,	—	3½	100	—	3 10 0
London & Home Counties, 1955–75	,,	4½	4½	114	—	3 19 0
London Passenger Transport, A.	,,	—	4½	125½	+1	3 11 9
Do. do. B.	,,	—	5	128½	—	3 18 0
Do. do. C.	,,	3	—	100	—	3 0 0
West Midlands Joint Elec. 1948–68	,,	—	5	115	—	4 7 0

TELEGRAPH AND TELEPHONE.

American Tel. & Tel.	$100	9	9	123½	+1	7 6 0
Anglo-Am. Tel. Pref.	Stock	6	6	116½	+1	5 3 0
Do. Def.	,,	1½	1½	27	+1½	5 11 1
Cable & Wireless 5½% Pref.	,,	2¾	4½	89	+4	4 12 9
Do. A. 7½% Ord.	,,	Nil	Nil	19½	+1½	—
Do. B. Ord.	,,	Nil	Nil	6½	+½	—
Globe Tel. & Tel. Ord.	10	Nil	2½	14	+1	1 15 9
Do. do. Pref.	10	6	6	14½	+½	4 3 6
Great Northern Tel.	10	20	20	40	+½	5 0 0
Marconi-Marine	1	10	7½	32/6	+1/-	4 12 4
Oriental Telephone Ord.	1	12	12	3/-	—	*3 12 5

HOME AND FOREIGN TRAMS, ETC.

Anglo-Arg. Trams First Pref.	5	Nil	Nil	2/-	—	—
Do. do. 2nd Pref.	5	Nil	Nil	1/6	—	—
Do. do. 5% Deb.	Stock	Nil	Nil	5	—	—
British Electric Traction Df. Ord.	,,	5	5	975xd	—	—
Do. do. Pref. Ord.	,,	8	8	70	+2	4 14 2
Brazil Traction	100	—	—	9½	—	—
Brit. Columbia Elec. Rly. Pce.	Stock	5	5	92½	—	5 8 1
Mexican Light Common	100	Nil	Nil	4	—	—
Do. 7% Pref.	100	7	7	5½	—	—
Do. 1st Bonds	$500	5	5	39½	—	—
Victoria Falls Ord.	1	15	20	7¾	—	2 14 6
Yorkshire (West Riding)	1	5	6½	32/-	+3/3	4 1 3

MANUFACTURING COMPANIES.

Aron Electricity Ord.	1	10	10	66/3	—	3 0 4
Assoc. Elec. Ord.	1	4	6	28/-	+6d.	4 5 9
Do. Prf.	1	8	8	37/-	—	4 6 4
Babcock & Wilcox	1	6	8	43/6	—	3 13 9
British Aluminium Ord.	1	5	7½	37/-	+6d.	4 1 2
British Insulated Ord.	1	5	15	4	—	3 15 0
Brush Ord.	Stock	Nil	Nil	37½	—	—
Callender's	1	15	15	5¼	—	4 5 9
Do. 6½% Pref.	1	6½	6½	32/6	—	4 0 0
Crompton Parkinson Ord.	5/-	22	12½	2¼	—	1 7 9
Do. 8% Pref.	1	8	8	36/3	—	4 8 5
Edison Swan 1st Pref.	1	7½	7½	27/6	—	5 9 0
Electric Construction	1	Nil	Nil	17/6	+1/-	—
Enfield Cable Ord.	1	25	25	4¼	—	5 2 6
English Electric	1	Nil	Nil	10/9	+1/-	—
Do. do. Pref.	1	Nil	Nil	17/-	—	—
Ever Ready	5/-	35	35	21/9	—	8 1 0
Ferranti Pref.	1	7	7	28/6	—	4 18 3
G.E.C. Pref.	1	6½	6½	33/9	—	3 17 0
Do. Ord.	1	8	8	53/9	+½	3 19 6
Henley's	1	30	30	6¾	−¼	4 9 0
Do. 4½% Pref.	5	4½	4½	5¼	—	3 16 8
India-Rubber Preferred	1	—	5½	1½	—	4 17 9
Johnson & Phillips	1	5	7½	34/6	—	4 7 0
Siemens Ord.	1	6½	4	1¼	—	3 11 1
Telegraph Construction	£1	Nil	Nil	1½	—	—

* Dividends paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings will be taken.

1933

20400. "Means for measuring the instantaneous value of an alternating current quantity." International General Electric Co., Inc. July 19th, 1932. (427306.)

20488. "Hydrometers for electric accumulators." Chloride Electrical Storage Co., Ltd., and A. W. Browne. July 20th, 1933. (427307.)

20762. "Television arrangement with Braun tube." Radio-Akt.-Ges. D. S. Loewe, and K. Schlesinger. July 25th, 1932. (Addition to 420667.) (427546.)

24526. "Television systems." A. C. Cossor, Ltd., L. H. Bedford, and O. S. Puckle. September 4th, 1933. (427625.)

26446. "Telephone sets or attachments or accessories therefor." P. Swaine. September 26th, 1933. (427550.)

28072. "Radio receivers." Marconi's Wireless Telegraph Co., Ltd. November 3rd, 1932. (427629.)

28205. "Electrically driven rail and other vehicles." T. Hornbuckle. October 12th, 1933. (427392.)

28382. "Perforated tape transmitters for signal recorders." Siemens & Halske Akt.-Ges. July 18th, 1933. (427321.)

28397. "Television systems." A. C. Cossor, Ltd., and L. H. Bedford. October 13th, 1933. (427630.)

28456. "Magnetic bodies, more especially in high-frequency electrical apparatus." Siemens & Halske Akt.-Ges. October 19th, 1932. (427322.)

28487. "Telegraphic apparatus for the transmission of current impulses." Siemens & Halske Akt.-Ges. February 3rd, 1933. (427395.)

28945. "Electrical signalling and indicating means." J. Stepham and H. E. Stiles. October 19th, 1933. (427325.)

28977. "Electric converting apparatus." British Thomson-Houston Co., Ltd. October 26th, 1932. (427483.)

28987. "Electromagnetic relays for electric welding machines." New Process Welders, Ltd., and F. C. Hohs. October 19th, 1933. (427328.)

29046. "'Tell-tale' devices for indicating the failure of an electric circuit." F. G. Donaldson. October 20th, 1933. (427409.)

29101. "Electric welding machines." New Process Welders, Ltd., and F. C. Hohs. October 20th, 1933. (427634.)

29164. "Imitation fires." Premier Electric Heaters, Ltd., and A. E. Newton. October 21st, 1933. (427412.)

29346. "Hydraulic servo-motor for controllers of electric-power vehicles in multiple-unit trains, and for similar apparatus." Compagnie Internationale des Freins Automatiques. October 22nd, 1932. (Addition to 308,737.) (427416.)

29745. "Protective systems for electric circuits." British Thomson-Houston Co., Ltd., and R. T. Coe. October 26th, 1933. (427560.)

29862. "Magnetic structures and methods of manufacturing same." Standard Telephones & Cables, Ltd., S. E. Buckley, and L. W. Hallett. October 27th, 1933. (424639.)

29931. "High-voltage thermionic discharge devices such as rectifiers." T. E. Allibone, J. F. Smee, G. S. Innes and Associated Electrical Industries, Limited. October 27th, 1933. (427642.)

30090. "Electric current regulators." General Electric Co., Ltd., and E. P. L. Westell. October 30th, 1933. (427430.)

30587. "Radio receivers." Marconi's Wireless Telegraph Co., Ltd. November 5th, 1932. (427650.)

31439. "Fixing of wall plates or cover plates to flush electric switches, coupling sockets and the like." J. A. Crabtree. November 11th, 1933. (427341.)

35178. "Electrical connecting devices." British Insulated Cables, Ltd., E. A. Bayles, and F. Massey. December 14th, 1933. (427433.)

35772. "Processes and devices for automatic arc welding." Elin Akt.-Ges. für Elektrische Industrie. December 19th, 1932. (Cognate applications 35773/33 and 35774/33.) (427568.)

1934

51. "Electric discharge devices." M-O Valve Co., Ltd., and C. J. Smithells. January 1st, 1934. (427572.)

713. "Electric switches or circuit-breakers." D. R. Davies and Associated Electrical Industries, Ltd. January 8th, 1934. (427574.)

1163. "Electric erasing machine." E. W. C. Kearney. January 12th, 1934. (427440.)

1395. "Telephone systems." General Electric Co., Ltd., and O. I. Carpenter. January 15th, 1934. (427441.)

1688. "Electric discharge devices." M-O Valve Co., Ltd., and C. J. Smithells. January 17th, 1934. (427664.)

1692. "Electric motor control and braking systems." English Electric Co., Ltd., H. H. Andrews, P. Constant and P. L. Mardis. January 17th, 1934. (427442.)

2935. "Polarised electrical signalling apparatus." Ericsson Telephones, Ltd., A. Brookes, and A. Morley. January 29th, 1934. (427444.)

4534. "Withdrawable electric switchgear." Switchgear & Cowans, Ltd., and G. H. Neep. February 12th, 1934. (427356.)

4648. "Selective controlling devices for electrically operated brocade looms, card-cutting machines, and other similar purposes." K. Nakanishi and K. Nakanishi. February 13th, 1933. (427357.)

4649. "Electrically heated sterilising and cooking apparatus." M. Abraham and M. Jacobsohn. October 5th, 1933. (427581.)

6237. "Thermionic valves." Marconi's Wireless Telegraph Co., Ltd. (J. C. Smith). February 26th, 1934. (Convention date not granted.) (427360.)

3602. "Electric cables." British Thomson-Houston Co., Ltd. March 18th, 1933. (427584.)

9550/1. "Vibration dampers for electrical transmission lines." Aluminium, Ltd. March 31st, 1933. (427503/4.)

9777. "Direction-finding apparatus for use in wireless telegraphy." R. H. L. Bevan and C. E. Horton. March 29th, 1934. (427674.)

10803. "Reduction of the far-end cross-talk in trunk communication cables." Siemens & Halske Akt.-Ges. April 10th, 1933. (427365.)

11532. "Electrical ignition systems." D. W. Randolph, O. S. Duffendack, and R. A. Wolfe. May 1st, 1933. (427679.)

13008. "Automatic circuit-breakers." Compagnie Continentale pour la Fabrication des Compteurs et autres Appareils. May 1st, 1933. (427506.)

13310. "Loud-speakers." W. J. Tennant (Rola Co.). May 2nd, 1934. (427590.)

14661. "Carrier-wave signalling systems." British Thomson-Houston Co., Ltd. May 19th, 1933. (427508.)

14672. "Electron-discharge tube apparatus." Marconi's Wireless Telegraph Co., Ltd. May 30th, 1933. (Cognate application 14673/34.) (427509.)

18134. "Automatic circuit-breakers." Compagnie Continentale pour la Fabrication des Compteurs et autres Appareils. February 12th, 1934. (Addition to 427506.) (427512.)

18613. "Electric furnaces." P. Richalet. June 30th, 1933. (427514.)

18708. "Casings for electric accumulators." Soc. des Accumulateurs Electriques (Anciens Etablissements A. Dinin). July 11th, 1933. (427515.)

19002. "Devices for producing high-tension electric current." J. Gaglio. June 30th, 1933. (427594.)

19701. "Electrically heated hair-waving appliances." Electricitäts Ges. Sanitas. July 4th. 1933. (Cognate applications 19702/34, 19703/34, 19704/34, and 19705/34.) (427596.)

25178. "Signal transmission systems." Siemens & Halske Akt.-Ges. August 31st, 1933. (427525.)

25304. "Combined electrical regulators and automatic cut-outs." G. Milles. September 7th, 1933. (427381.)

26393. "Carrier-wave signalling arrangement." Standard Telephones & Cables, Ltd. December 7th, 1933. (Cognate application 26492/34.) (427605.)

29488. "Electron valves." Naamlooze Vennootschap Machinerieen-en Apparaten Fabrieken. October 13th, 1933. (427528.)

29628. "Electrodes for electron-discharge tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. April 3rd, 1934. (427607.)

29999. "Electric discharge tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. October 27th, 1933. (427609.)

32379. "Electrical measuring instruments." Siemens & Halske Akt.-Ges. December 8th, 1933. (427532.)

33697. "Electrolytic deposition of cobalt." H. M. J. Berger. November 23rd, 1934. (427458.)

35020. "Electric safety lamps operated by compressed air." R. Bosch Akt.-Ges. December 8th, 1933. (427617.)

1935

167. "Electric discharge lamps." General Electric Co., Ltd. January 4th, 1934. (427462.)

501. "Switch mechanism for controlling traffic signals." H. I. Holman, S. D. Hammond and J. G. Drysdale. January 7th, 1935. (427619.)

8616. "Amplifiers." L. L. de Kramolin. August 17th, 1933. (Addition to 415079.) (Divided out of Specification No. 415079.) (427384.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from May 15th :—

Ump. No. 558237. Class 8. Illuminated display signs, and direction indicators for vehicles and for traffic control.—Ernest and C. A. Harrison, 2, Lathom Street, Bury, Lancs.

Ultra (lettering and design). No. 558345. Class 8. Radio-telephonic and telegraphic apparatus and parts thereof, loud-speakers, transformers, condensers, &c.—Ultra Electric, Ltd., Ultra Works, Erskine Road, N.W.3.

Thermoflex. No. 557249. All goods in Class 8.—W. Wilkinson, The Hollies, Hollyland Road, Shustoke, Warwickshire.

Imagicon. No. 559449. Class 8. Apparatus for use in transmitting and/or receiving images and scenes, and/or sounds by television, telegraphy or telephony.—Baird Television, Ltd., 58, Victoria Street, Westminster, S.W.1.

Hoar Frost on Power Lines

At a recent meeting of the Société Française des Electriciens an interesting paper was read by M. H. Milon on "Observations on the Abnormal Formation of Hoar Frost on a Power Transmission Line in the Jura." The observations were made in February last on the line which connects the Chancy-Pougny power station and the Henri Paul sub-station at a point about 4,920 ft. above sea level. In severe weather hoar frost formed on the line to the extent of just over 50 lb. per yard.

It was not possible to shake off the frost by the usual methods and resort had to be had to the heating of the conductors in order to melt the rime. To this end the line was short-circuited about 13 miles from the power station and fed by two generators at increasing voltage up to 9,700 V to provide 620 A in each phase. Observers were stationed at various points along the line to record the time taken to cause the hoar frost to melt and fall away. It took two hours to clear the line entirely, while the power used for the purpose amounted to 3,500 kW at a power factor of 0.35.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aberdeen.—Boulevard to beach (£98,600); T. F. Henderson, city engineer.

Abingdon.—Houses (50); borough surveyor.

Accrington.—Houses (37), Balmoral Road; J. W. Hodgson.

Acton.—Extensions, factory, Old Oak Common Lane; Couch & Coupland, architects. Extensions, works, Acton Lane; S. Peach & Partners, architects.

Arbroath.—Houses (276); burgh surveyor.

Ashford (MIDDLESEX).—Houses (43), Clockhouse Lane; Mercer & Rudd.

Barnet.—Church and school, Mays Lane and Elton Avenue; Baptist Authorities.

Birmingham.—Cinema, "The Regent," Alcester Lanes End, Maypole (£25,000); S. Roberts, architect, Lombard House, Great Charles Street. Maternity and child welfare centre, Yardley Wood; Nichol, Nichol & Thomas, architects, 117, Colmore Row.

Blackpool.—Bakery; Blackpool Co-operative Society.

Bradford.—Printing works, Bingley Road; W. N. Sharpe, Ltd.

Bristol.—Girls' and boys' schools (360 places each), South Bristol, for E.C.

Buckinghamshire.—School, Amersham, for County E.C.; D. E. Cooke, secretary, Aylesbury.

Carlisle.—Houses (26), Harraby Estate; T. Irwin & Sons.

Chelmsford.—School, Princes Road (750 places), for Borough E.C.; G. E. Barford, clerk.

Chester.—Senior school, Poynton; F. Anstead Browne, architect, The Castle, Chester.

Chippenham.—Houses (84) and bungalows; Building & Public Works Construction Co., Ltd., Swindon, builders.

Coseley.—Houses (32), Harding Street; J. P. Clark, architect, Regent Chambers, Wednesbury.

Crewe.—Public baths (£30,000), (electrical work), Valley Park; borough surveyor.

Darfield.—Houses (80), Wood Hall Lane; Dyson Cawthorne & Coles, architects, Regent Street, Barnsley.

Dartford.—Houses (116), Heath Lane Estate; Housing Committee. Extensions, hospital, with nurses' home, &c. (£65,830), for the Joint Hospital Committee; clerk.

Denton.—Extensions, hospital; R. Hopkins & Sons.

Dewsbury.—Extensions, Classic Works, Mill Road; Speights, Ltd. Extensions, Hoyle Head Mills; S. Lyles, Sons & Co., Ltd.

Doncaster.—Extensions, hospital, including operating theatre, and shops, Market Hall; R. E. Ford, estates surveyor, 3, Priory Place.

Dover.—Houses (102) and flats, St. Radigund's Road; borough surveyor.

Droitwich.—Houses, Chequers Lane, Wychbold; S. T. Holmes, builder, Wychbold.

Dudley.—Houses (160), Foxyards Estate; F. H. Gibbons, borough engineer, Priory Hall. School, Wren's Nest; Hy. Boot & Co., builders, Sheffield.

Dukinfield.—Houses (42), near Thorncliffe Avenue and Freeman Road; Cormack & Co. (Lancs.), Ltd., builders, Broadstone Hall Estate, Heaton Chapel, Stockport.

Durham.—School, Burnhope, for E.C.; J. J. Hodges & Sons, Ltd., Ewell, Surrey. School, Sherburn, and remodelling, Framwellgate Council School; F. Willey, County School Architect, 34, Old Elvet.

Edinburgh.—Buildings, canal basin site (£300,000); Stewart, Kaye, architect.

Essex.—Third section, County Hall, Chelmsford (£93,250); county architect.

Exeter.—Cinema, on the site of the London Hotel, for the Associated British Cinemas, Ltd.

Forth (LANARKSHIRE).—Houses (150); Jn. Stewart, 20, Albert Street.

Fraserburgh.—Houses (76); W. F. Hamilton, burgh surveyor, 51, Mid Street.

Gateshead-on-Tyne.—Cinema, Low Fell, for Smelt's Theatres, Ltd.; H. Waller, builder, Bk. Waller Street, Newcastle-on-Tyne.

Glasgow.—Cinema, Ibrox; J. Easton, architect, 248, West George Street.

Godstone.—Houses (35), and flats; Stanley Easter, R.D.C. surveyor, Oxted.

Hampshire.—Senior and junior schools, Millbrook; director of education, Winchester.

Hertfordshire.—Grammar School, East Barnet (£30,000); F. Fraser Granger, architect. School, Beaumont Estate, St. Albans; county surveyor. Extensions, Underhill School, Barnet, for County E.C.

Highworth (WILTSHIRE).—Houses (30) and bungalows, Brewery Street; Building & Public Works Construction Co., Ltd., builders, Swindon.

Hyde.—Houses (48), Victoria Street; borough engineer. Council offices, Greenfield Street; T. Warrington.

Hythe (KENT).—Houses (73); E. A. Jackson, architect, 114, High Street.

Irish Free State.—(CLONMEL).—Reconstruction for Mental Hospital (£98,000); Hospital Committee. (Co. MAYO).—Two technical schools, Belmullet and Achill, for Vocational E.C. of Castlebar; R. M. Butler, architect, 82, Merrion Square, Dublin. (DROGHEDA, Co. LOUTH).—Houses (136); Drogheda borough surveyor, Courthouse, Drogheda. (DUN LAOGHAIRE, Co. DUBLIN).—Houses (81); Sallynoggin; P. J. Hernon, town clerk and borough manager.

Jedburgh.—Houses (80), Headrigg Park; surveyor.

Kent.—County school for boys, Gravesend, for County E.C. Schools, Chislehurst, and Northfleet, also enlargement, County Girls' School, Ramsgate, and reconstruction, Girls' Grammar School, Maidstone; county architect.

Kettering.—Houses (48) Wallis Road; W. & J. Bunning. Extension, factory, Shaftesbury Street; G. Tailby & Co.

Kirkcaldy.—Municipal buildings; burgh surveyor.

Lancashire.—School, Lowton; director of education, Preston.

Leicestershire.—Schools and extensions (£60,000), for County E.C.

Lincoln.—Children's homes and nursery, St. Giles Estate; city surveyor. School, Cross-o-Cliff; C. W. Hooton, director of education.

London.—(HAMMERSMITH).—Houses, Westway (£500,000); L.C.C. architect. (ST. PANCRAS).—Reconstruction, Haverstock Central School (£27,785); L.C.C. architect. (LEWISHAM).—Houses (24), Whitefoot Lane; Wates (Streatham), Ltd. (WESTMINSTER).—Extensions, Middlesex Guildhall; county architect. (STREATHAM).—Grammar School, Drewstead Road (£55,000); Battersea Grammar School Governors & L.C.C. (KENNINGTON).—School, Oval site (£30,203); W. H. Gaze & Sons, Ltd.

Malton.—Houses (20); R.D.C. surveyor.

Manchester.—Houses, Banson Estate, Altrincham Road, Wythenshawe; Kays Building Co., Woodhouse Lane, Ashton-on-Mersey. Church, Oxford Place, Victoria Park; Roberts & Wood, architects, 26, King Street. Shops (60), Wythenshawe (during the next five years); Housing Committee.

Midhurst (SUSSEX).—Houses (40); R.D.C. surveyor.

Morecambe.—Houses (44), adjoining Westgate; E. Kershaw, builder, Devonshire Road.

Newcastle-on-Tyne.—Houses (185), Daisy Hill Estate; R. G. Roberts, housing architect, 18, Cloth Market. Aircraft factory; Airspeed, Ltd. Hotel for James Deuchar, Ltd., Heaton; James Lunn & Sons, builders, St. Mary's Place.

Newtown Linford (LEICESTERSHIRE).—Estate development, Groby Road; W. Smith.

Northern Ireland.—(ARMAGH).—Elementary school, King's Park, Lurgan, for Armagh E.C.

Norwich.—Houses (50), and extensions, Poor Law Institution (£56,000); city engineer. Senior schools, Thorpe Hamlet; director of education.

Oxfordshire.—Schools, Witney and Kidmore End, for County E.C.; director of education, Oxford.

Paignton.—Houses (28), Colley End Road; A. Coombe.

Penrith.—Houses, Carleton Road; I. Armstrong & Sons.

Pershore.—Offices, including Council Chamber, adjoining Poor Law Institution, Station Road; F. B. Andrews & Son, architects, 95, Colmore Row, Birmingham.

Perth.—Houses (50); Offices, County Buildings.

Peterhead.—Houses (32), Ives Road; Jas. Dickie, burgh surveyor, Arbuthnot House.

Portsmouth.—Houses (36), Wembly Grove; G. & W. Mitchell. Baths, winter garden, café, &c., Lump Fort site (£150,000); E. R. Pawson, assessor. Laundry, Second Avenue; Simonds Bros. & Son, Ltd. Schools, Court Lane and Paulsgrove, for E.C. Extensions, 27-35, Arundel Street; Timothy Whites, Ltd.

Purley.—Two factories and laundry, Commerce Way, for the Croydon Factory Estate, Ltd.

Ramsgate.—Estate development, Park Road; Grummant Bros.

Redditch.—Extension, factory, Clive Road; S. Allcock & Co.

Rochdale.—Public baths, Entwistle Road; surveyor, Town Hall.

Romsey (HAMPSHIRE).—Houses (93); R.D.C. surveyor.

Roxburgh.—Buildings, Jedburgh Grammar School, for E.C.

Rushden.—Houses (22), Irchester Road Estate; W. Thompson & Sons, Ltd., Irthlingborough.

Saltcoats.—Houses (46); G. Horley, burgh surveyor, Kyleshill.

Scarborough.—Houses (30) and flats; J. P. Watson, borough engineer.

Sedgley.—Laboratories, Dibdale Works; Gibbons, Ltd.

Shropshire.—Technical college, Shrewsbury, for C.C.; A. G. Grant, architect, 5, Belmont, Shrewsbury.

Somerset.—Schools, Bridgwater, and extensions, infants' school, Milton Park Road, Weston-super-Mare; county architect.

Southall.—Houses (60), Hayes Bridge Estate; Hayes Bridge Estates, Ltd. Houses (20), Maple Grove; G. Wimpey & Co., Ltd. Houses (150), Viaduct Field Estate; R. Fielding & Son. Shops, The Green; A. & B. Hanson, Ltd.

Staffordshire.—Elementary school, Stone Road, Housing Estate, Stafford; G. C. Lowbridge, architect, County Offices, Stafford.

Surrey.—School (284 places), Stoneleigh, Ewell, for County E.C.; secretary, Kingston-on-Thames.

Uttoxeter.—Houses (20), Timberlane Estate; Derwent Builders, Ltd., Derby.

Wakefield.—Houses, Lupset Estate and other estates; borough architect. Cinema, Kirkgate; Associated British Cinemas, Ltd.

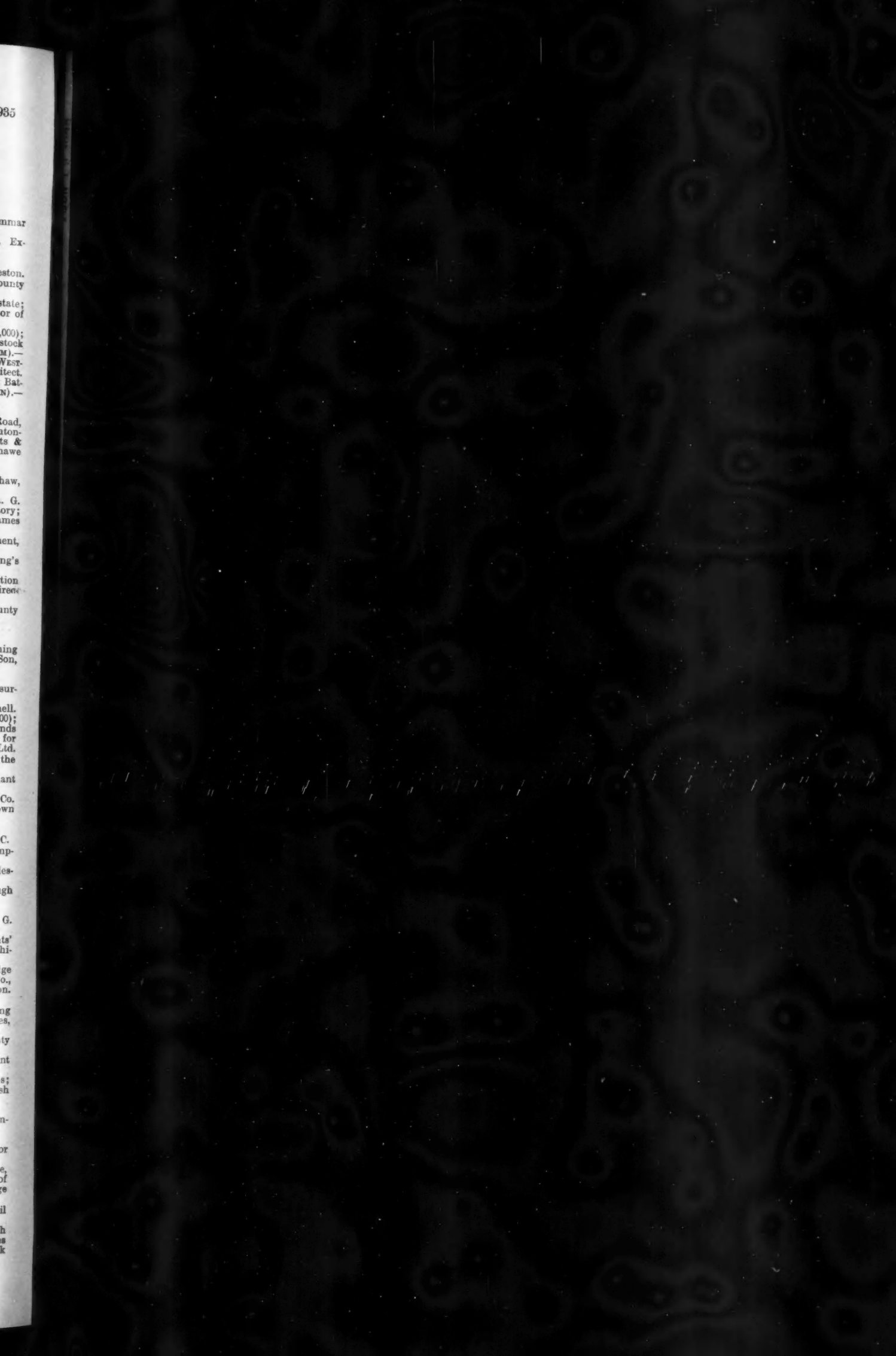
Welshpool.—Houses (136); borough surveyor.

Wembley.—Extensions, hospital (£95,000); Management Committee.

West Lothian.—Houses (170), £90,000; county clerk.

West Riding.—School, Sprotborough Lane, Bentley, for County E.C.

Wigan.—Houses, Roundmoor Estate, Coniston Park Drive, Boar's Head; H. Darbyshire, builder, Standish. Alterations of Hippodrome for Wigan Entertainments, Ltd., 1, College Avenue; John Johnson & Sons, builders, Caroline Street.

Willenhall.—Houses (86), Bilston Lane; G. A. Waite, Council House.

Wolverhampton.—Houses, Cannon Street (£216,000); borough engineer. Houses (24), Kingsway Road; T. Mucklow. Houses (259), Warstones Road; A. & J. Mucklow. Shops, Fallings Park Estate; M. A. Boswell.